

U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

LITHOLOGIC DESCRIPTION OF SEDIMENT CORES FROM

BUCK LAKE, KLAMATH COUNTY, OREGON

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Introduction

As part of a series of investigations designed to study the Quaternary climatic histories of the western U.S. and the adjacent northeastern Pacific Ocean, two sediment cores were collected from Buck Lake, Klamath County, Oregon, in the fall of 1991. This report presents basic data concerning the Buck Lake site, as well as lithologic descriptions of the recovered sediments. The drilling methods and core sampling and curation techniques used are described by Adam (1993).

Acknowledgement

Coring at Buck Lake was made possible by the gracious cooperation of the Charley family, owners of most of Buck Lake.

Site description

Buck Lake is a broad open valley that lies just east of the crest of the Cascade Range and about 34 km west of Klamath Falls, Oregon (Figure 1). The basin is roughly circular and about 2.5 km in diameter (Figure 2). The basin is fed by an extensive system of springs along its western side, and contained a shallow lake until the 1940's, when it was drained for pastureland after an attempt at muskrat farming proved unsuccessful (Hugh Charley, oral communication, 1991). Numerous shallow ditches cut across the exposed lake bottom, and the pastureland is irrigated every few weeks during the summer months.

The basin lies at an elevation of about 1500 meters. Regional bedrock consists of basalt and basaltic andesites of Pliocene and upper Miocene age (Walker and McLeod, 1991). The eastern rim of the basin is a faulted block oriented NNW-SSE; the outflow from Buck Lake has cut a small gorge through this block to the east, where the drainage joins that of Spencer Creek (Figure 2). About 7 km NNE of Buck Lake is the Mountain Lakes Wilderness Area, with elevations up to 2500 meters. Peaks in the Mountain Lakes Wilderness Area were glaciated during at least the most recent Pleistocene glacial interval (Carver, 1972), but the glaciers were mostly confined to the north side of the peaks, and neither ice nor glacial runoff directly affected the Buck Lake basin.

Drilling operations

Because the landowner reported that the lake sediments were fairly soft towards the middle of the basin and the drill rig was heavy (35 tons), we were not able to drill in the center of the basin, where the sediments are presumably thickest. The approximate location of the core holes is shown on Figure 2. A 1992 attempt to core nearer to the center of the basin using a manually-operated Livingston piston corer was halted when we could not penetrate very firm sediment at a depth of less than 2 meters.

Core descriptions

Two cores, designated here as Core 1 and Core 2, were taken at Buck Lake on September 21 and 22, 1991.

Core 1 reached a maximum depth of 41.31 meters, and extended about 70 cm into fresh volcanic bedrock. The top of the core was sampled using Shelby tubes; recovery with the Shelby tubes was limited to the top 4 meters. Coarse-grained sediment prevented any core recovery from 4.0 to 5.26 meters. Below 5.26 meters, cores were taken using a conventional rotary drill rig and drilling mud, as described by Adam (1993).

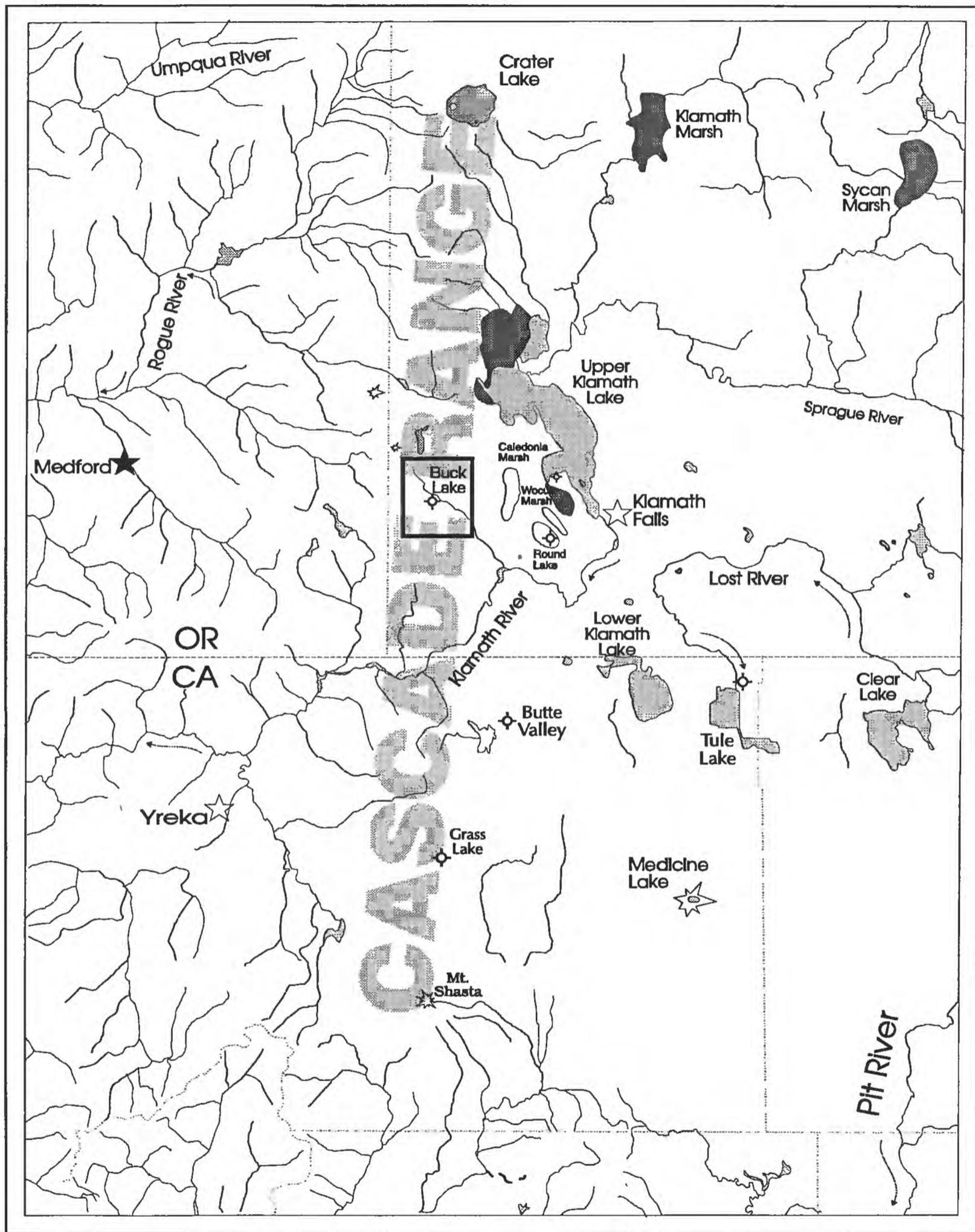


Figure 1.--Map of the southern Cascades region, showing locations of drill sites and major drainages. Box shows location of Fig. 2.

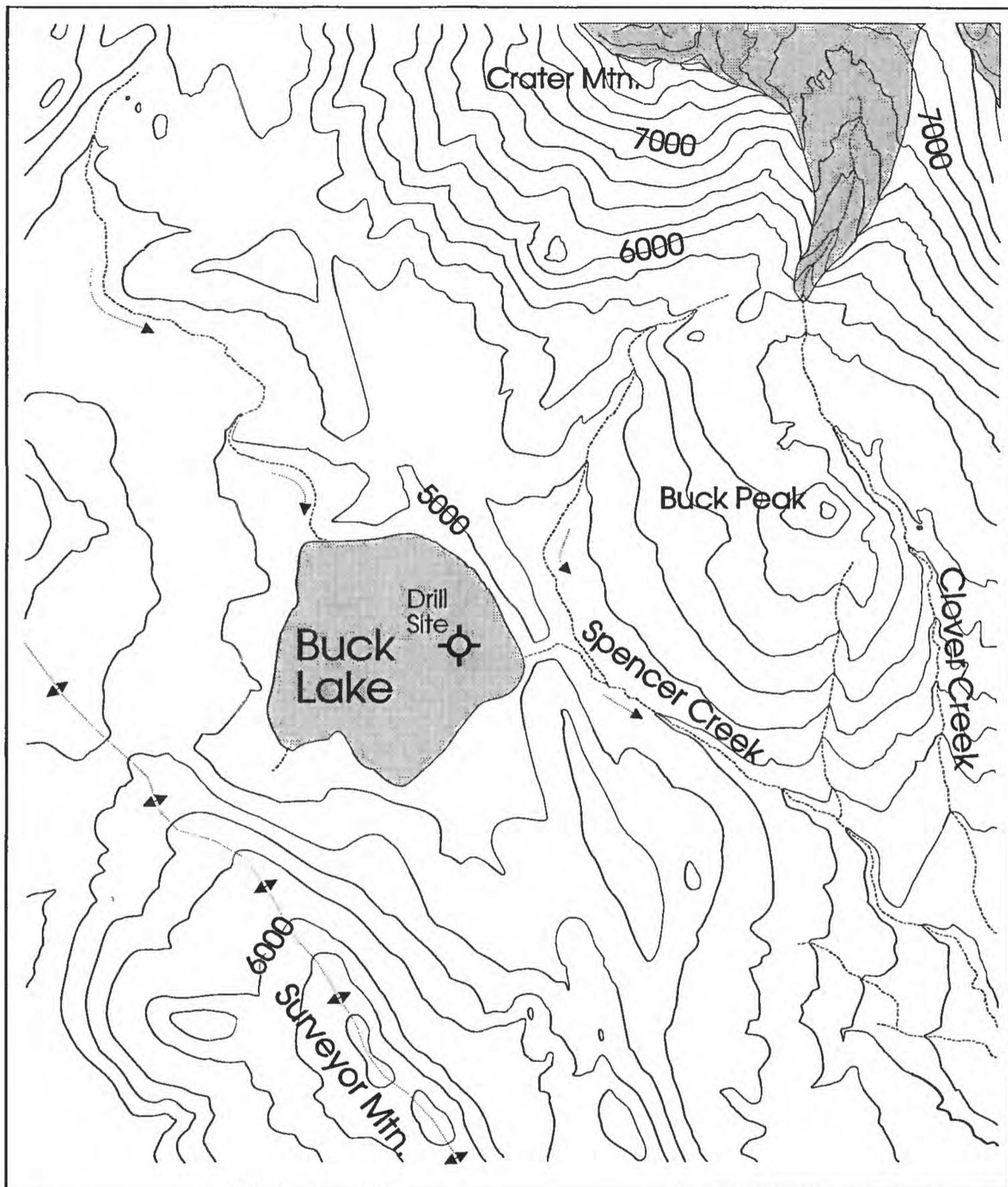


Figure 2.--Locality map showing relation of Buck Lake to surrounding topography. Shaded regions at upper right represent maximum extent of late Pleistocene glaciation on Crater Mountain as inferred from topographic maps. Elevations are in feet; arrows indicate downstream direction.

Core 2 was taken in an attempt to get better core recovery in the top 4 meters of the section. The locality chosen for Core 2 was about 80 meters north of the Core 1 locality. Core 2 reached a maximum depth of 6.12 meters using only Shelby tubes. Coarse sediments frequently collapsed into the hole, with the result that the total length of sediment recovered (6.76 m) is greater than the depth of the hole.

Core recovery

The depth interval drilled for each drive and the percent recovery are shown in Figure 3 and in Tables 1 (Core 1) and 2 (Core 2). For each core, the Figure 3 column labeled "Drives" shows an unlabeled, shaded box for each drive recovered. The upper boundary represents the depth at which drilling began for that drive as reported by the driller plus a possible adjustment to account for >100% recovery. These boxes are offset in an alternating pattern to facilitate comparison of the bottom of one drive with the top of the next drive. Immediately to the right of the "Drives" column, the "Slugs" column displays similar but labeled boxes that identify the drive, the slugs (A, and sometimes B) into which the drive was divided for storage, and the thickness of sediment actually recovered. In addition, some drives are plotted using a vertical offset that compensates for apparent overlap between drives. The data used are shown in Tables 1 and 2.

As an example, consider Core 1, Drive 10. The base of drive 9 penetrated to a greater depth than the start of drive 10, as is shown in the left-hand ("Drives") column of Fig. 3. (The bottom of drive 9 and the top of drive 10 have the same driller's depths, but the recovery for drive 10 was 112.8%; the "extra" recovery is assumed to represent material left in the hole when drive 9 was recovered.) Similar overlaps are found between drives 13 and 14 and between drives 16 and 17. However, the total amount of sediment recovered from the hole, as shown in the "Slugs" column, can be accommodated within the total depth drilled if a few adjustments are made to the top depths of selected drives. The adjustment for drive 10 is -0.12 m, as shown in the column labeled "Offset" (Table 1). The offset is added to the driller's depth for the top of the drive to produce a calculated depth for the top of the drive. The depths shown on the lithologic logs in Appendices B and C are based on the calculated depths for the tops of the drives.

Dating

Age control for the cores is derived from four correlatable tephra layers identified in Core 1. Ages and depths for these tephra are given in Table 3. The lacustrine part of the section is of middle Pleistocene age. The well-rounded basaltic gravel at about 5 meters depth indicates an interruption in lacustrine deposition, probably because the basin filled with sediment. Resumption of deposition above the gravels suggests that the fault-bounded block that impounds the present basin to the east was elevated by a few meters within the past 200 kyrs.

Lithology

A very generalized lithology of the Buck Lake section is shown in Figure 3; detailed lithologic logs for cores 1 and 2 are shown in Appendices B and C, using the patterns shown in Appendix A. Depths are shown in meters from the ground surface. Each stratigraphic unit is described to the right of the stratigraphic column. Most descriptions were taken from the fresh cores in the field, but some further descriptions were done in the laboratory. Color codes are taken from the Rock Color Chart distributed by the Geological Society of America (Rock Color Chart Committee, 1948).

The record indicates rapid initial filling of a volcanic bedrock basin, followed by sealing of the basin by fine materials about 600-700 kyrs ago. A series of lacustrine clays was then deposited between about 700 ka and 200-300 ka, when the basin filled with sediment and gravels were deposited. Sometime within the past 200 ka, the fault block just east of the lake was elevated relative to the basin, impounding a new lake that persisted into historic times.

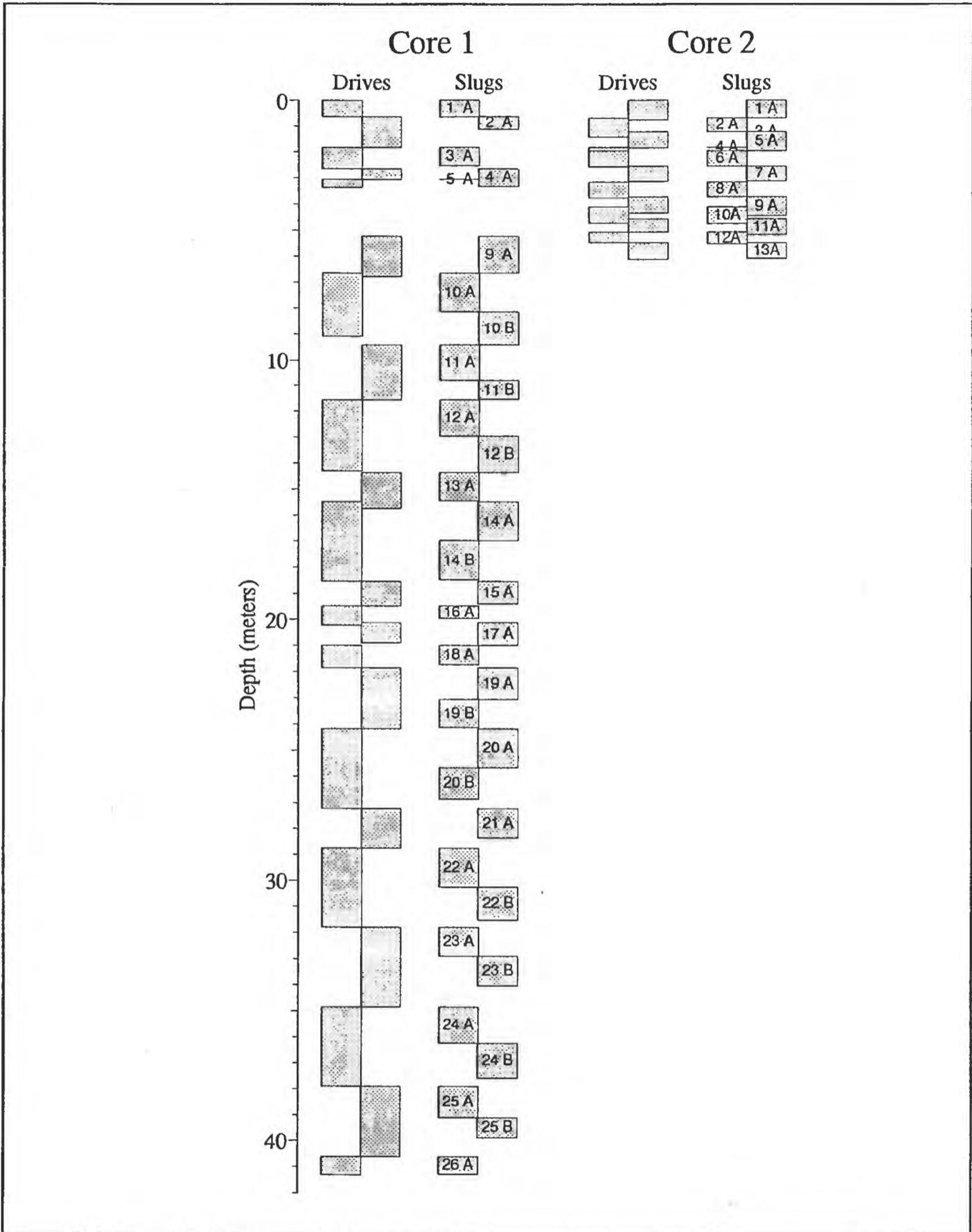


Figure 3.--Graphical representation of core recovery for Buck Lake Cores 1 and 2. See text for explanation.

Table 1.--Drive data for Buck Lake Core 1

Drive Number	Driller's Depth (m)		Recovery		Offset	Calculated depth for top of drive (m)
	Top	Bottom	meters	percent		
1	0.00	0.64	0.64	100.8	0.00	0.00
2	0.64	1.83	0.49	41.0	0.00	0.64
3	1.83	2.64	0.49	59.7	0.00	1.83
4	2.64	3.07	0.69	159.7	0.00	2.64
5	3.07	3.38	0.00	0.0	0.27	3.34
9	5.26	6.78	1.40	91.8	0.00	5.26
10	6.78	9.22	2.75	112.8	-0.12	6.66
11	9.22	11.38	2.15	99.6	0.19	9.41
12	11.38	14.13	2.80	102.0	0.19	11.57
13	14.13	15.50	1.08	78.7	0.24	14.37
14	15.50	18.55	3.00	98.4	0.00	15.50
15	18.55	19.49	0.86	91.5	0.00	18.55
16	19.49	20.22	0.49	66.5	0.00	19.49
17	20.22	21.01	0.89	113.0	-0.10	20.12
18	21.01	21.87	0.74	85.7	0.00	21.01
19	21.87	24.16	2.26	98.8	0.00	21.87
20	24.16	27.24	2.70	87.8	0.00	24.16
21	27.24	28.76	1.14	74.8	0.00	27.24
22	28.76	31.81	2.76	90.5	0.00	28.76
23	31.81	34.86	2.24	73.5	0.00	31.81
24	34.86	37.91	2.73	89.5	0.00	34.86
25	37.91	40.62	1.98	72.8	0.00	37.91
26	40.62	41.31	0.67	97.7	0.00	40.62

Drive Number	Driller's Depth (m)		Recovery		Offset	Calculated depth for top of drive (m)
	Top	Bottom	meters	percent		
1	0.00	0.76	0.68	89.2	0.00	0.00
2	0.76	1.52	0.55	72.2	-0.08	0.68
3	1.52	1.83	0.00	0.0	-0.29	1.23
4	1.83	2.13	0.00	0.0	0.00	1.83
5	1.68	2.29	0.73	119.7	-0.45	1.23
6	2.03	2.64	0.58	95.1	-0.07	1.96
7	2.64	3.25	0.73	119.7	-0.10	2.54
8	3.25	3.86	0.58	95.1	-0.08	3.17
9	3.86	4.47	0.69	113.2	-0.11	3.75
10	4.12	4.73	0.63	103.3	0.00	4.12
11	4.57	5.08	0.62	122.0	0.00	4.57
12	5.08	5.49	0.45	110.7	0.00	5.08
13	5.49	6.12	0.61	96.0	0.00	5.49

Tephra layer	Depth (m)	Age (kyr)
Loleta ash bed/Bend pumice	9.47-9.64	300-400
Rockland ash bed	19.85-19.98	400-470
Dibekulewe ash bed	20.79-20.85	470-665 (best guess ~500)
Lava Creek B ash bed	22.33-22.35	665
Rye Patch Dam ash bed	22.59-22.61	670-700

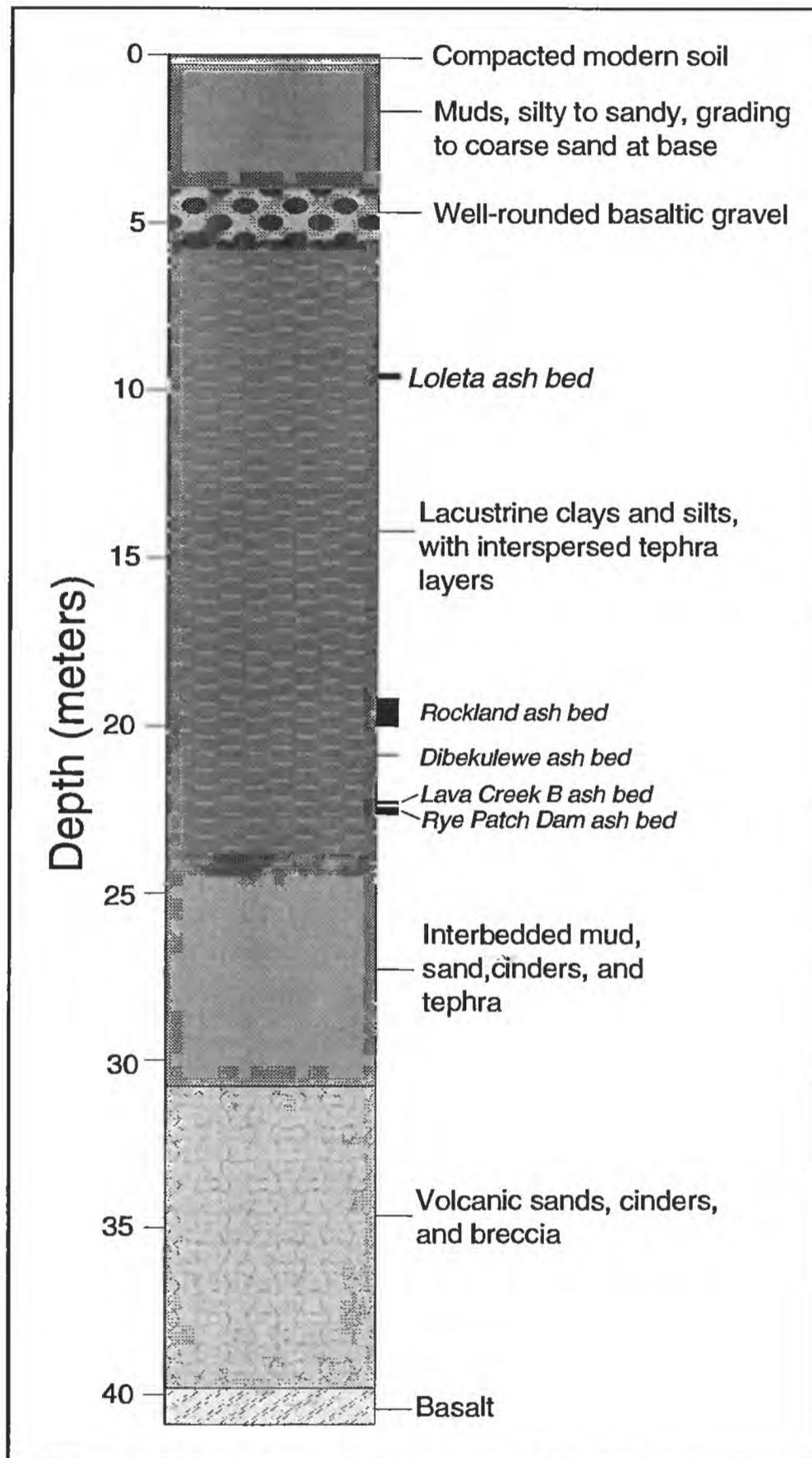


Figure 4.--Generalized lithology of the Buck Lake section.

References Cited

Adam, David P., 1993, Field core processing techniques used by U.S.G.S. 1991 drilling operations in the Upper Klamath Basin, Oregon and California: U.S. Geological Survey Open-File Report No. 93-20, 16 p.

Carver, Gary A., 1972, Glacial geology of the Mountain Lakes Wilderness and adjacent parts of the adjacent parts of the Cascade Range: Unpublished Ph.D. dissertation, University of Washington, 76 p. (Available from University Microfilms, #73-13,803).

Rock Color Chart Committee, 1948, Rock Color Chart. Geological Society of America, 10 p. (reprinted, 1980).

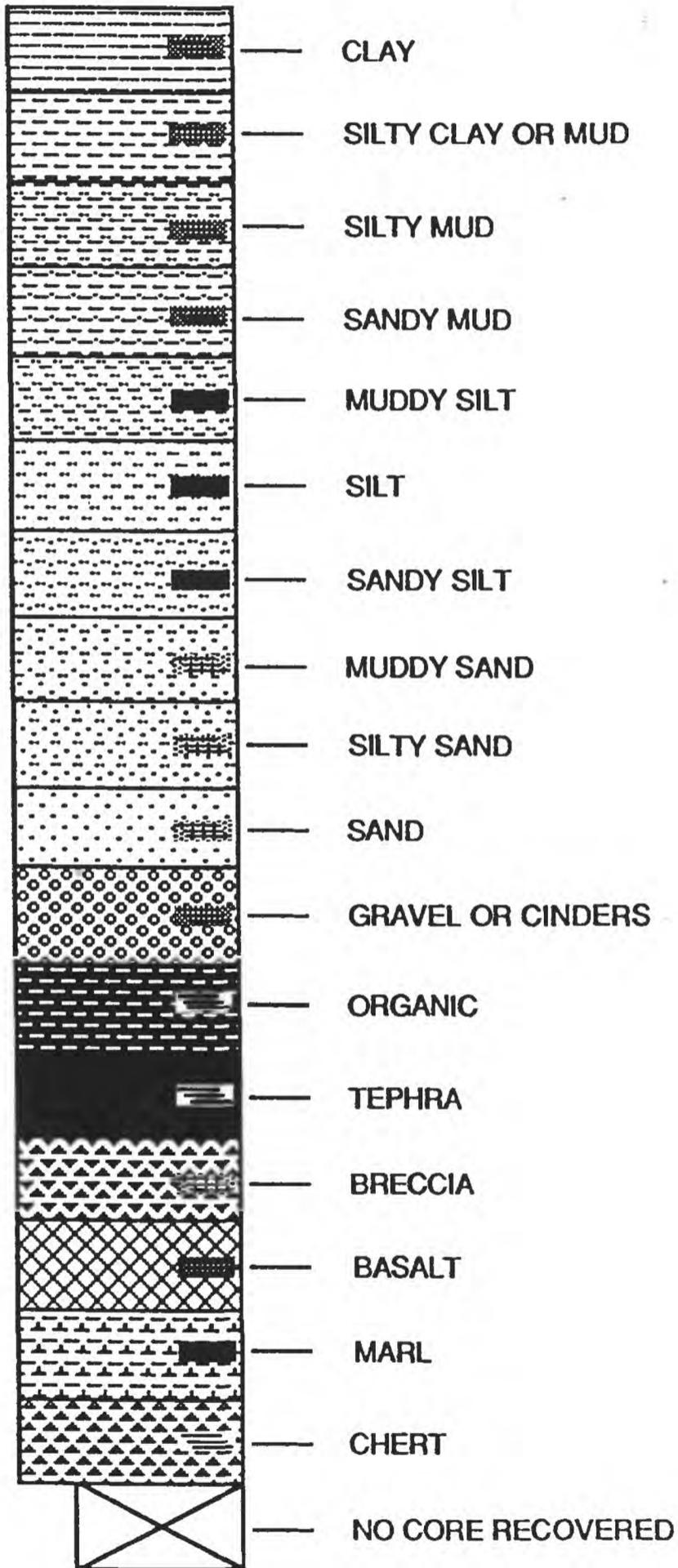
Walker, G.W., and MacLeod, N.S., 1991, Geologic Map of Oregon: U.S. Geological Survey, scale 1:500,000.

Appendix A

Legend showing patterns used for Lithologic Logs

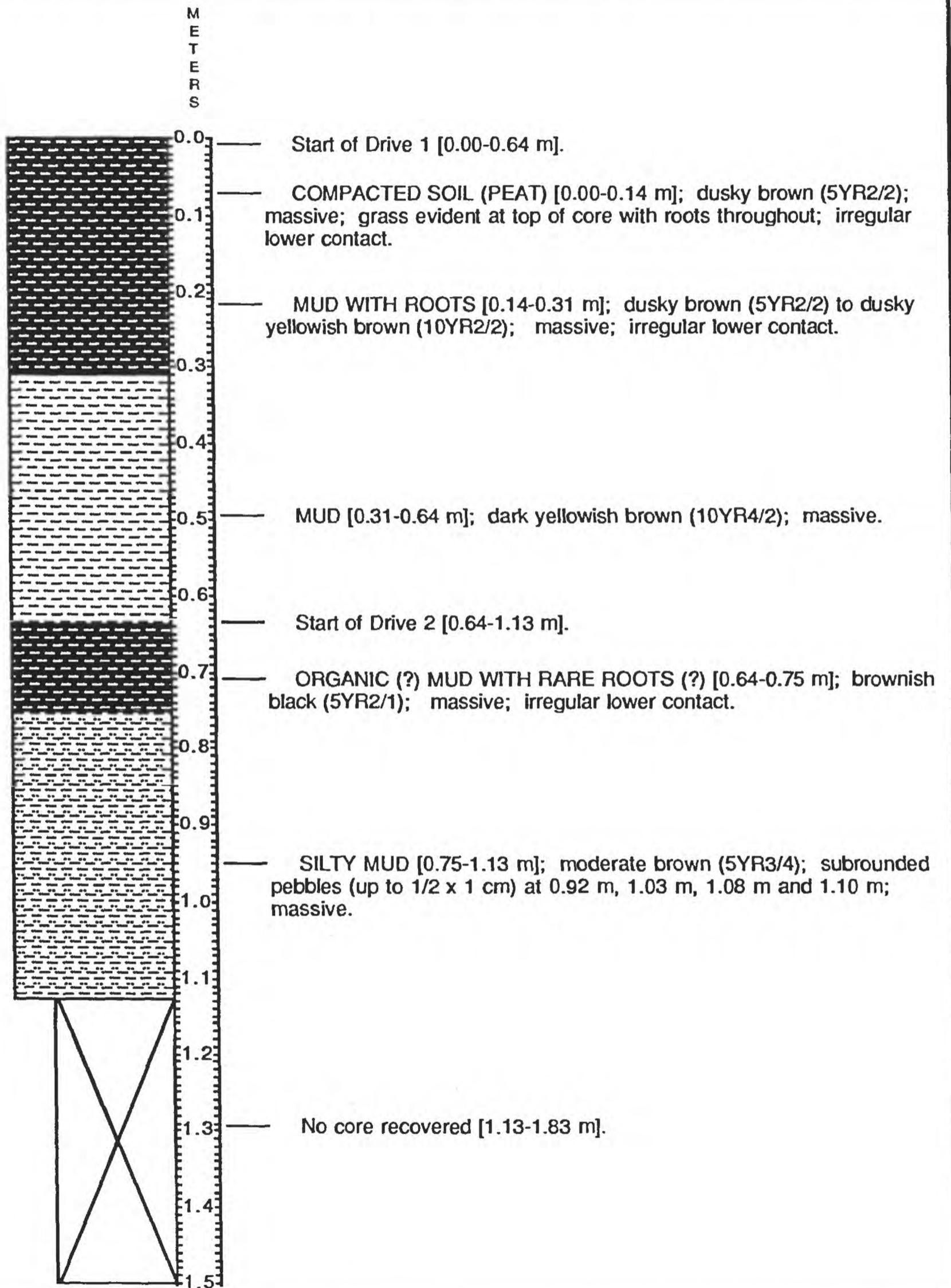
Small box inset within each pattern is used to indicate varying degrees of laminations within the unit (see written descriptions for more detail).

KEY TO LITHOLOGIES AND LAMINATION SYMBOL

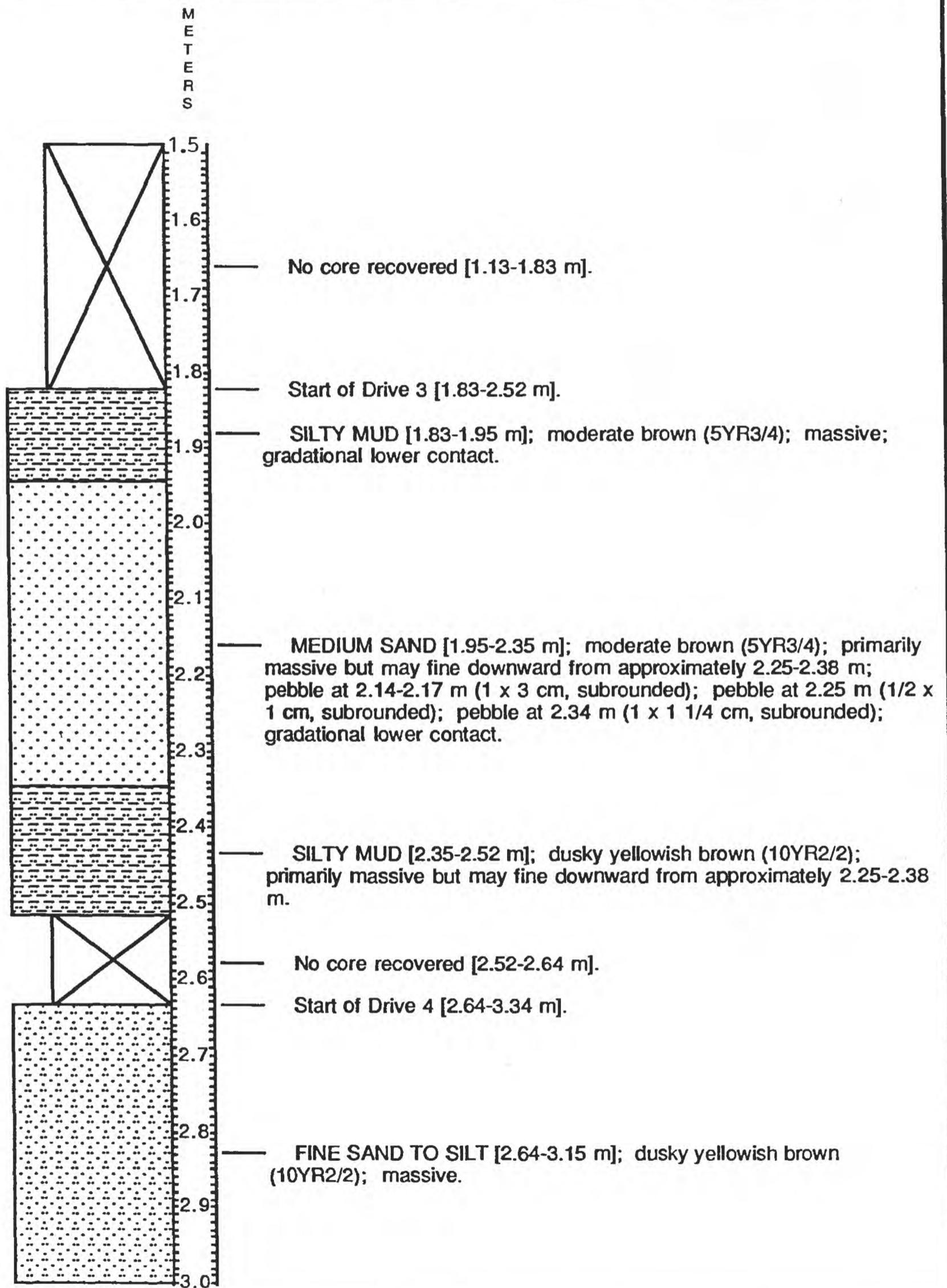


Appendix B
Core 1 Lithologic Log

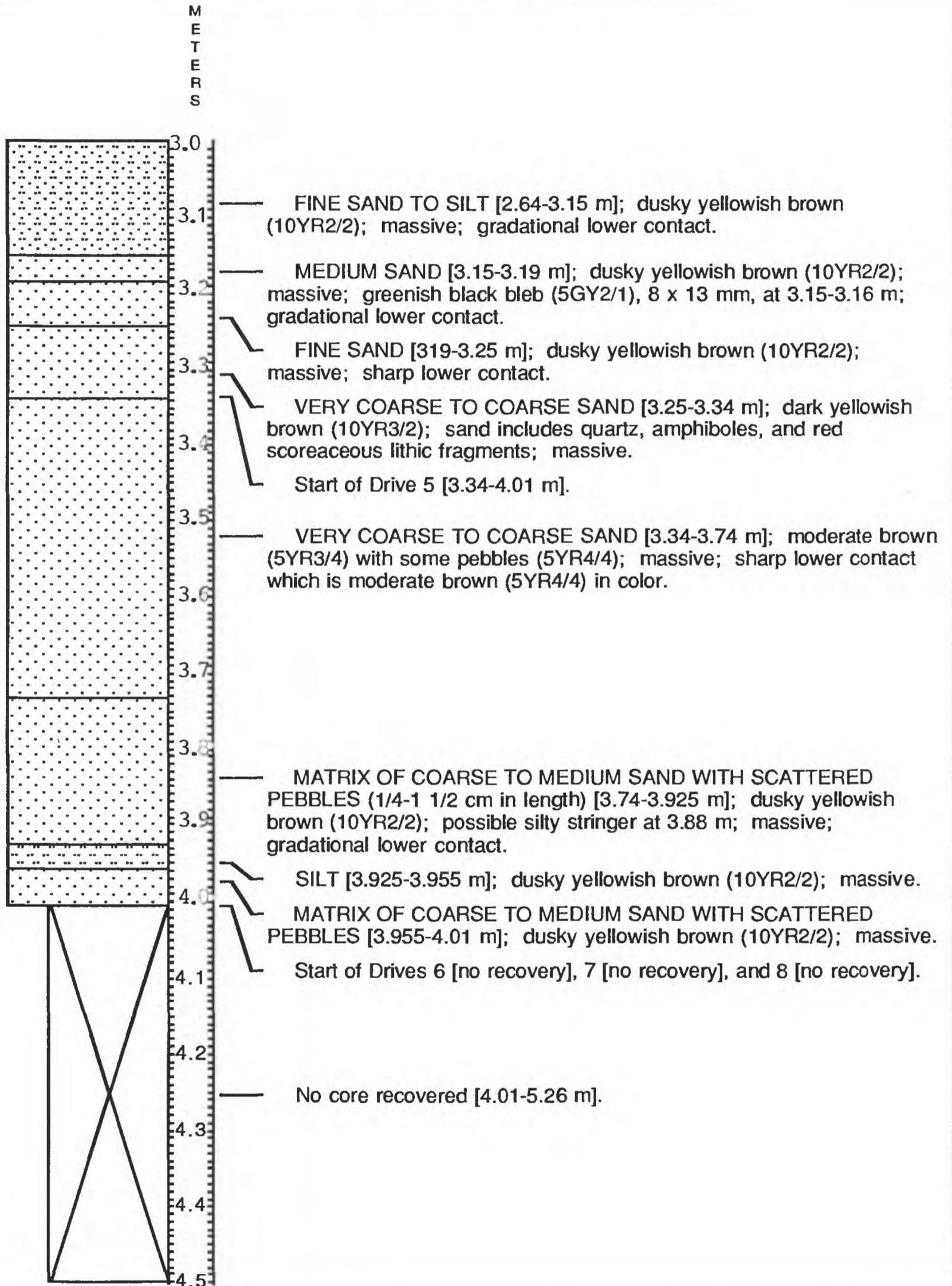
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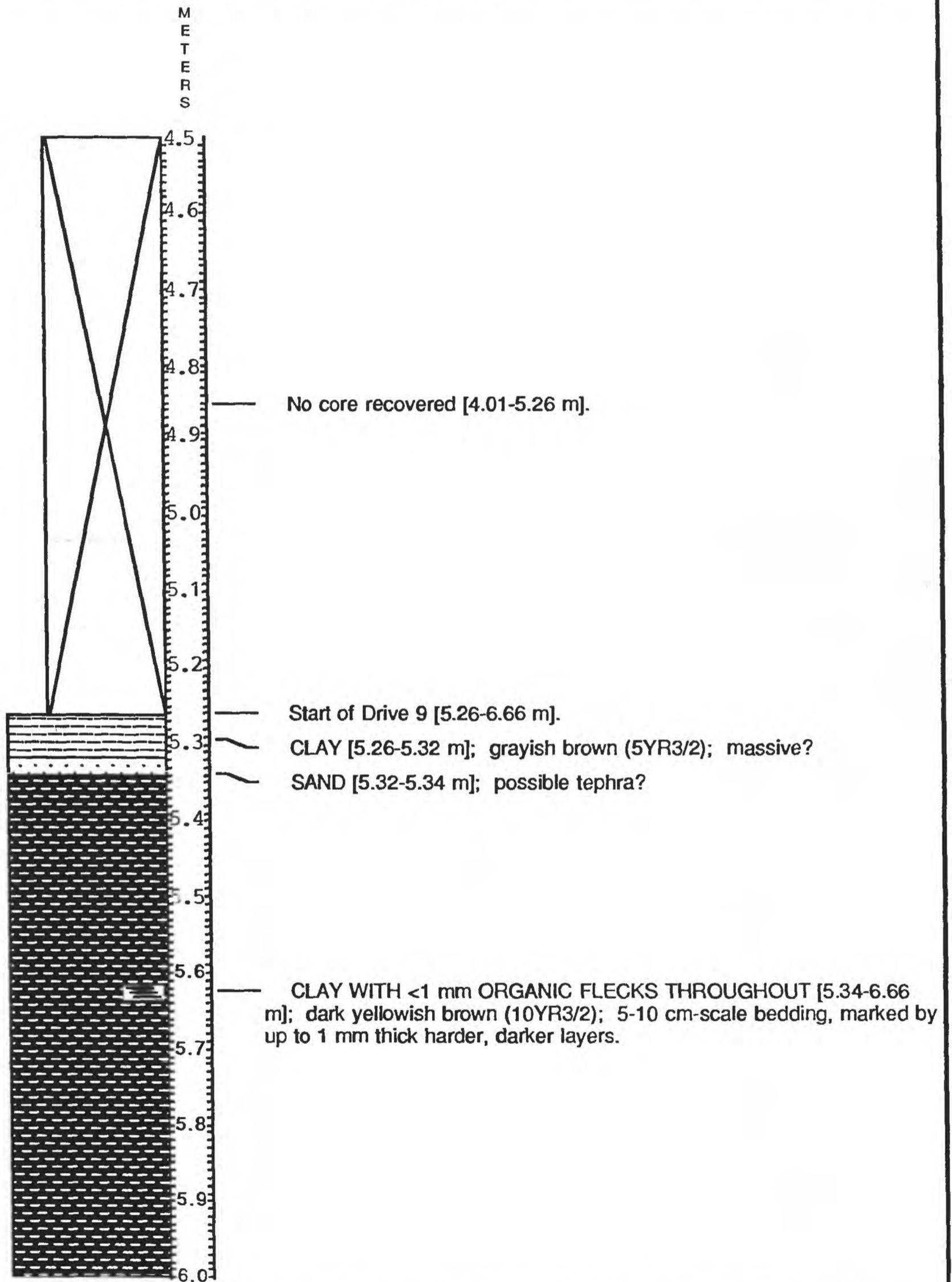
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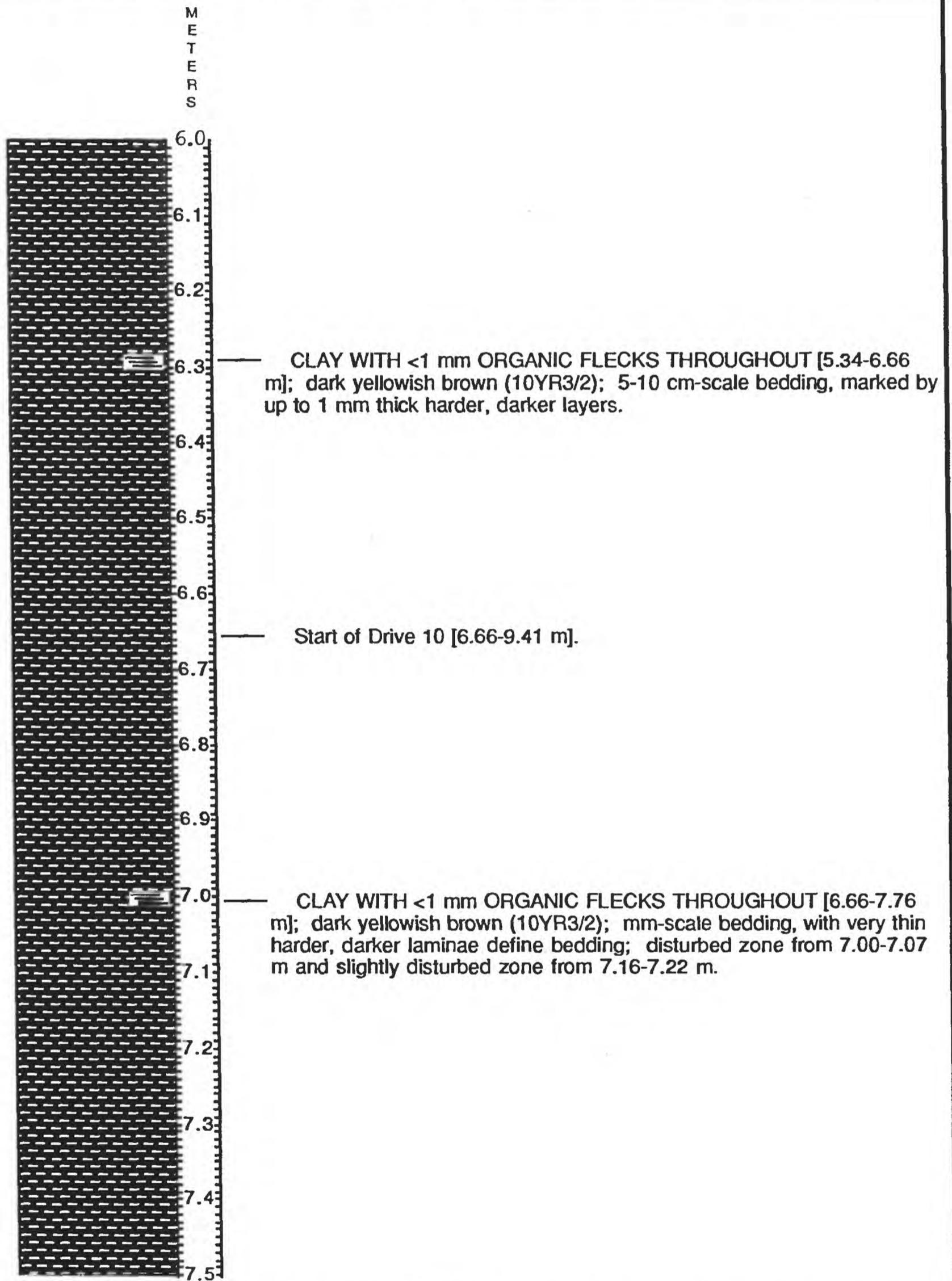
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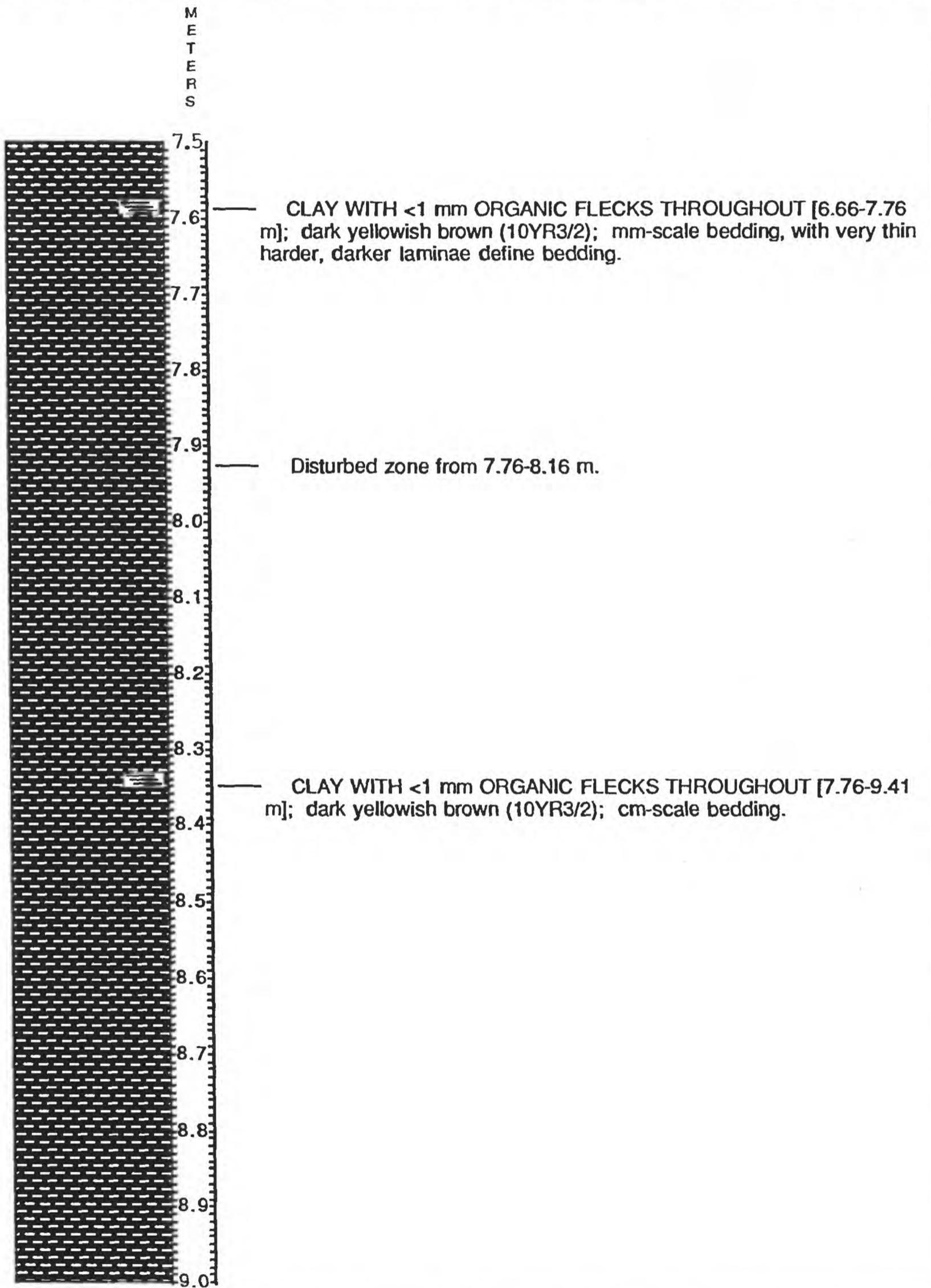
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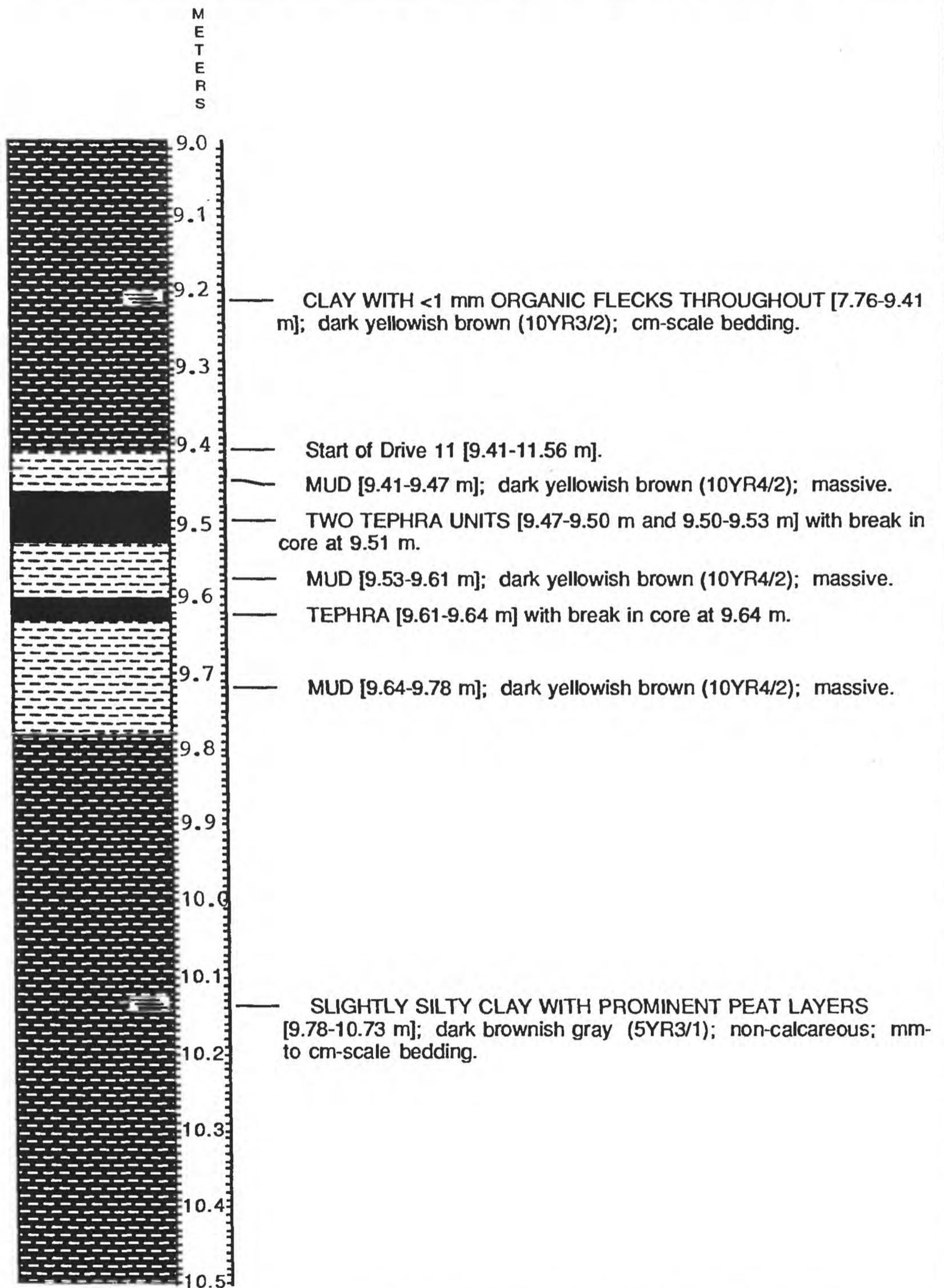
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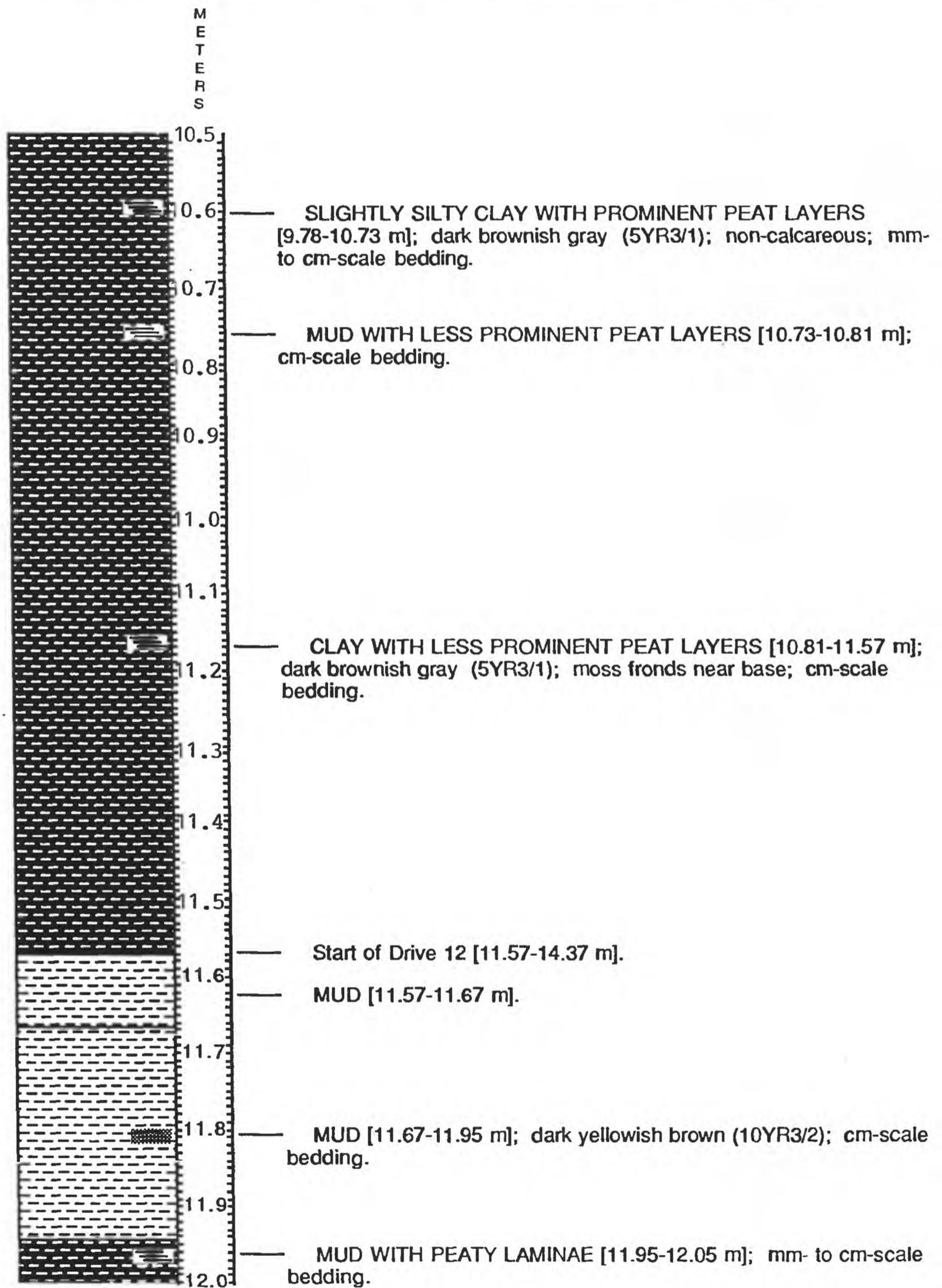
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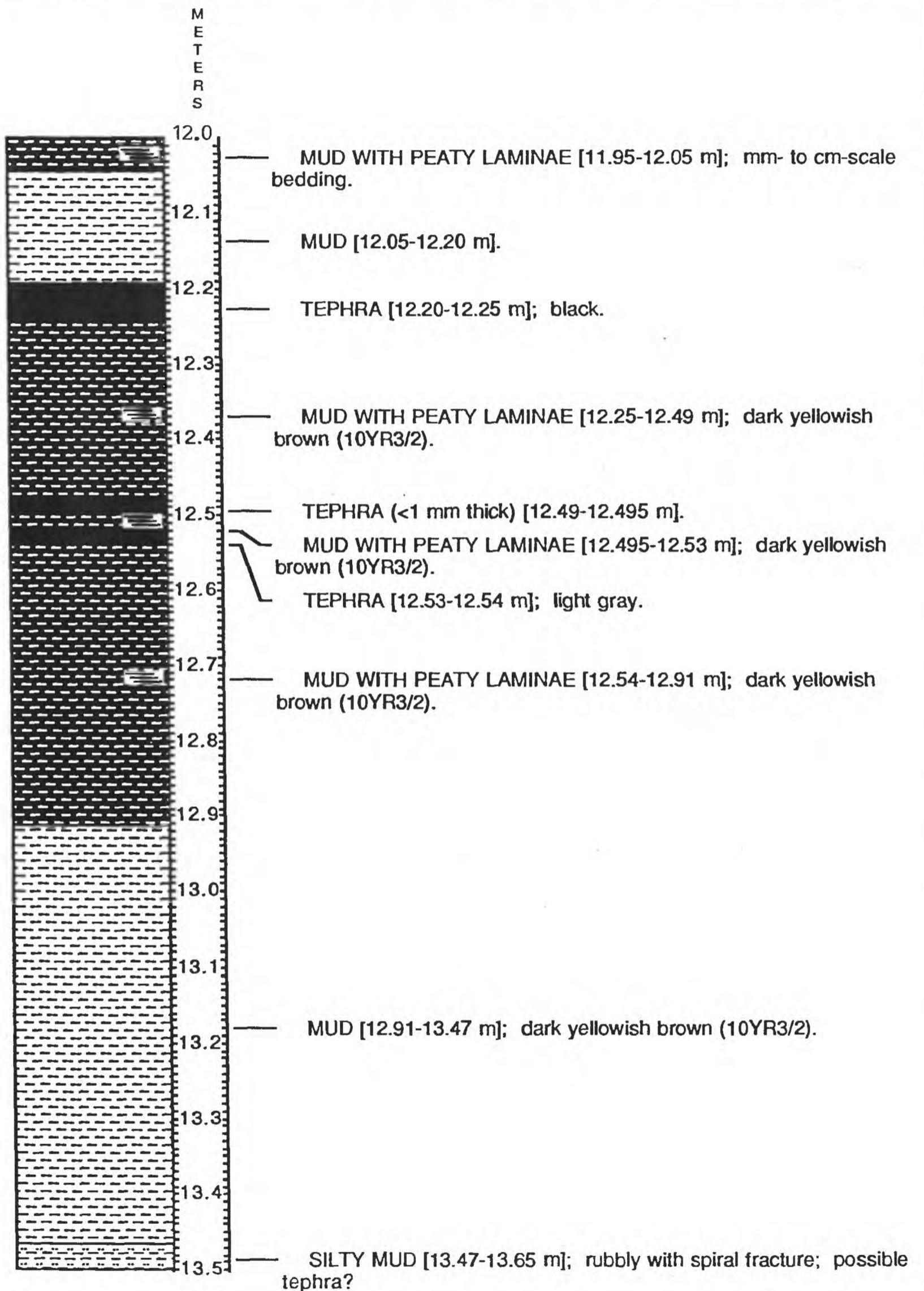
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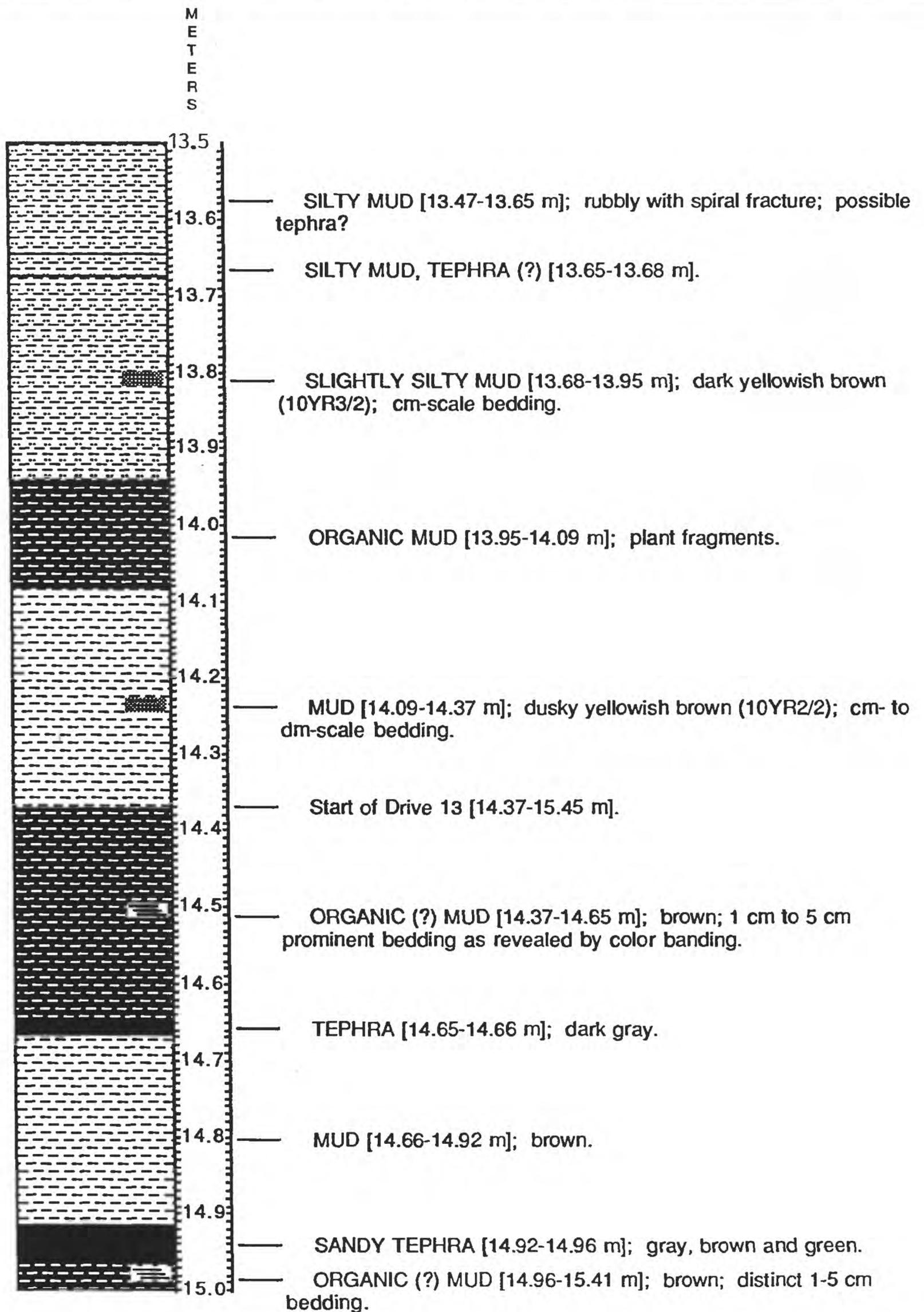
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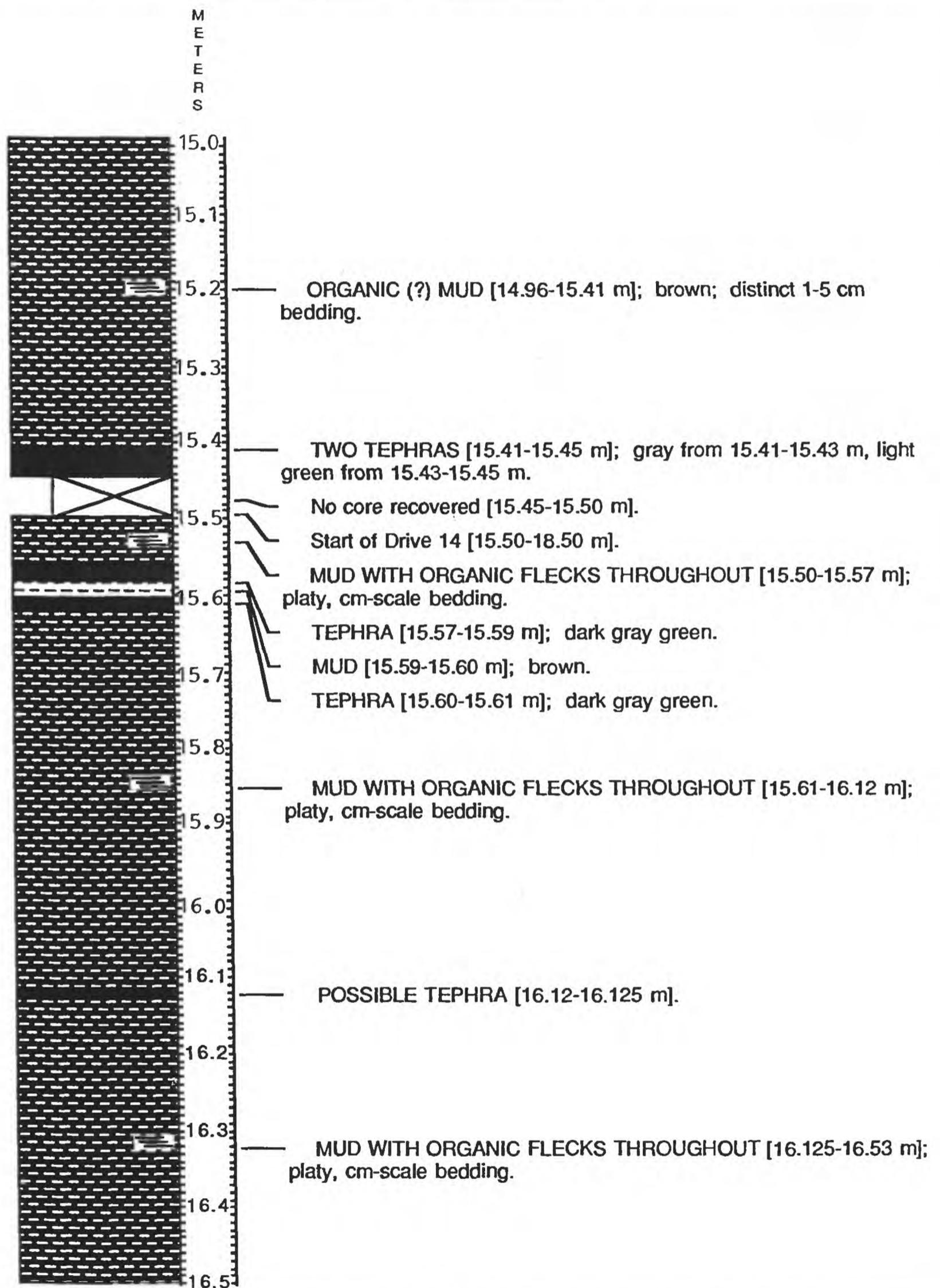
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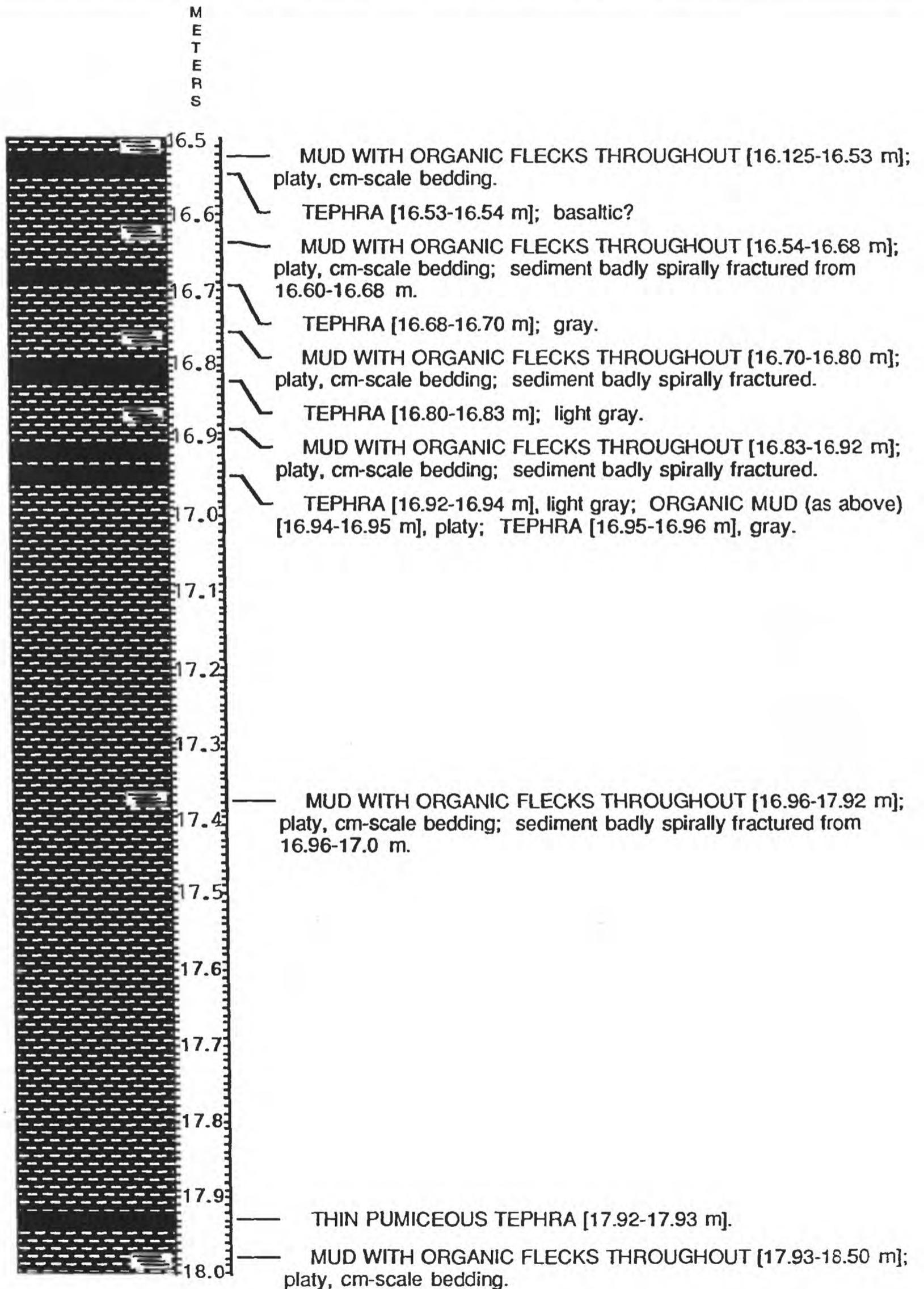
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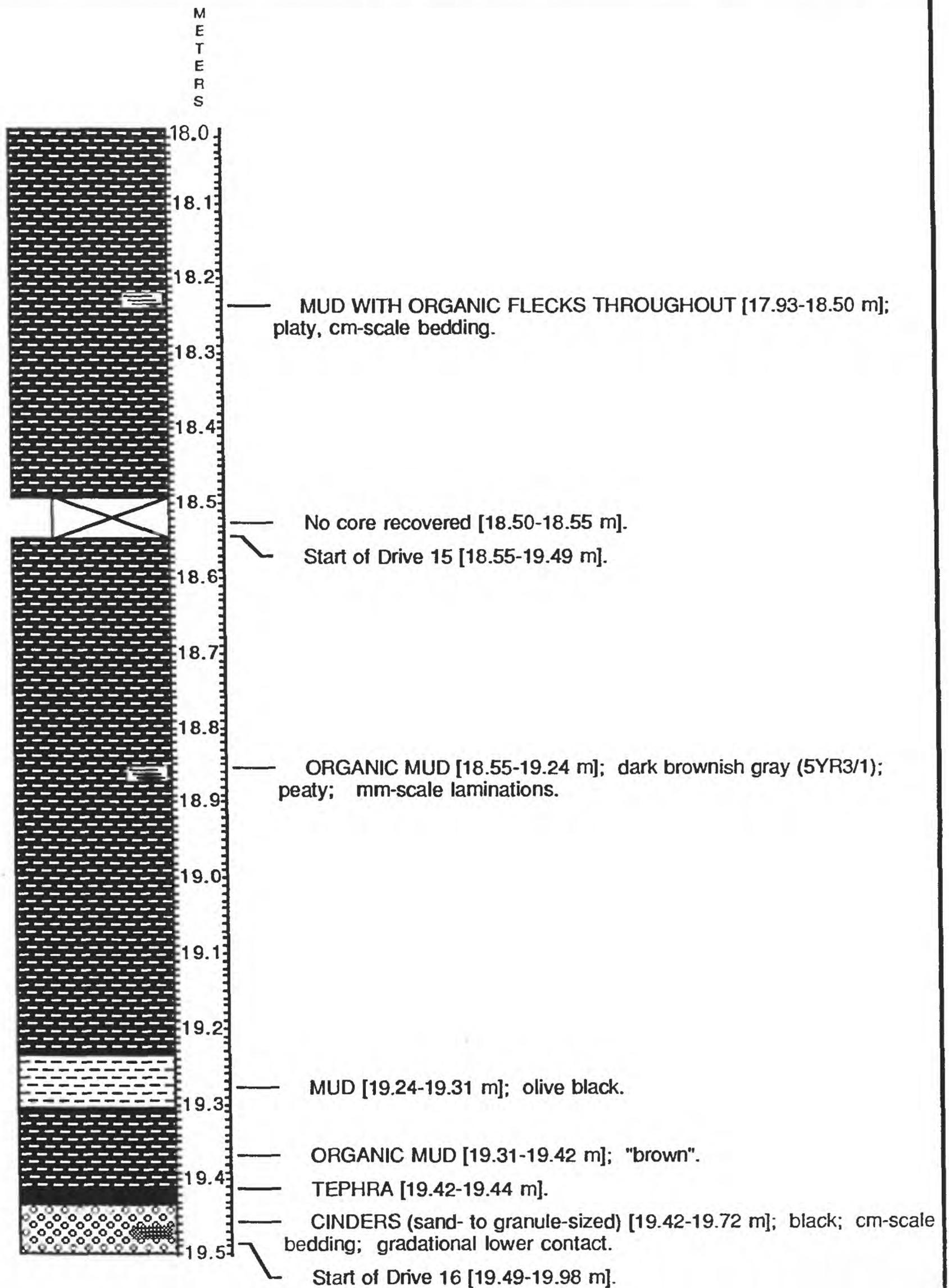
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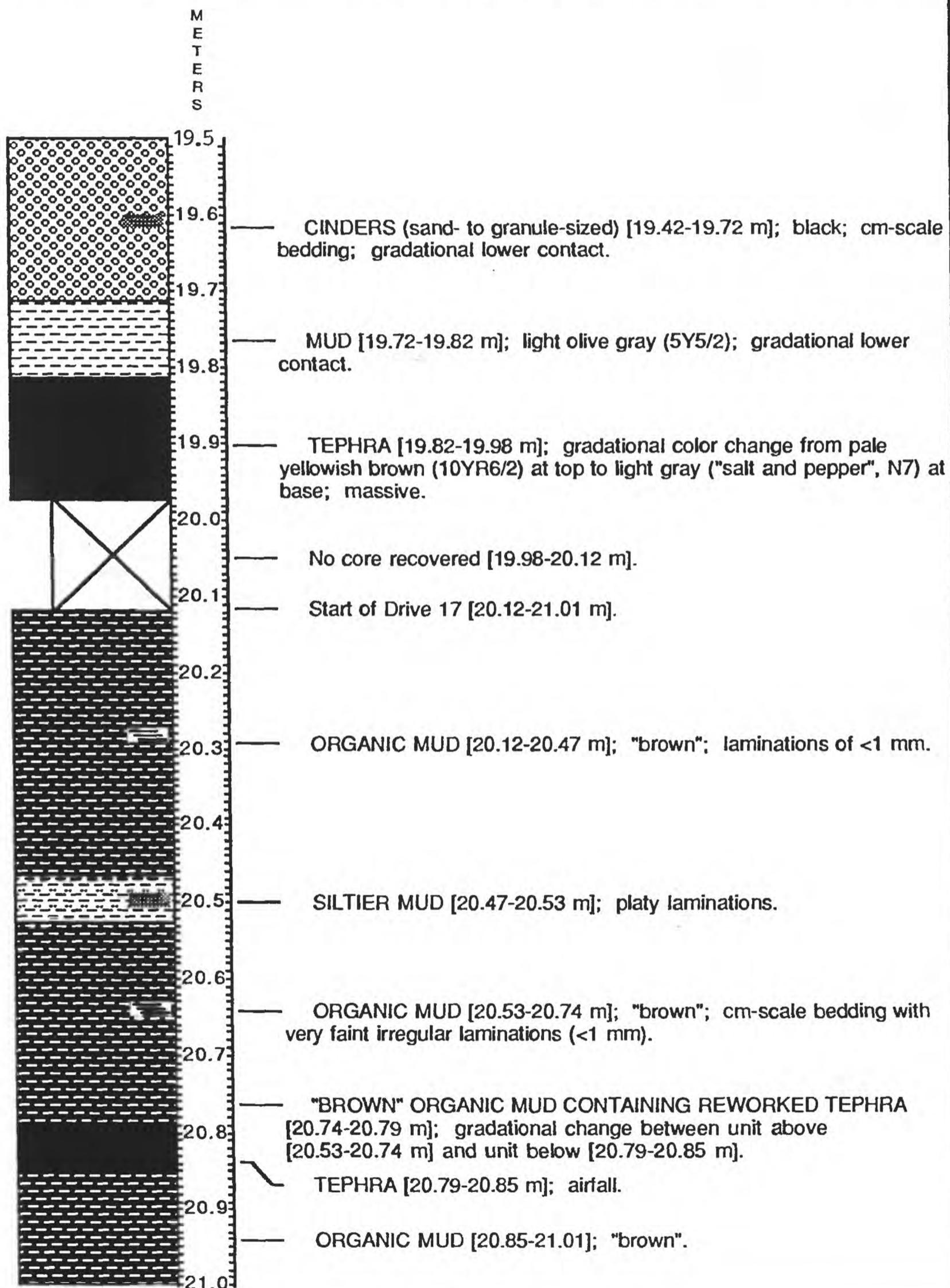
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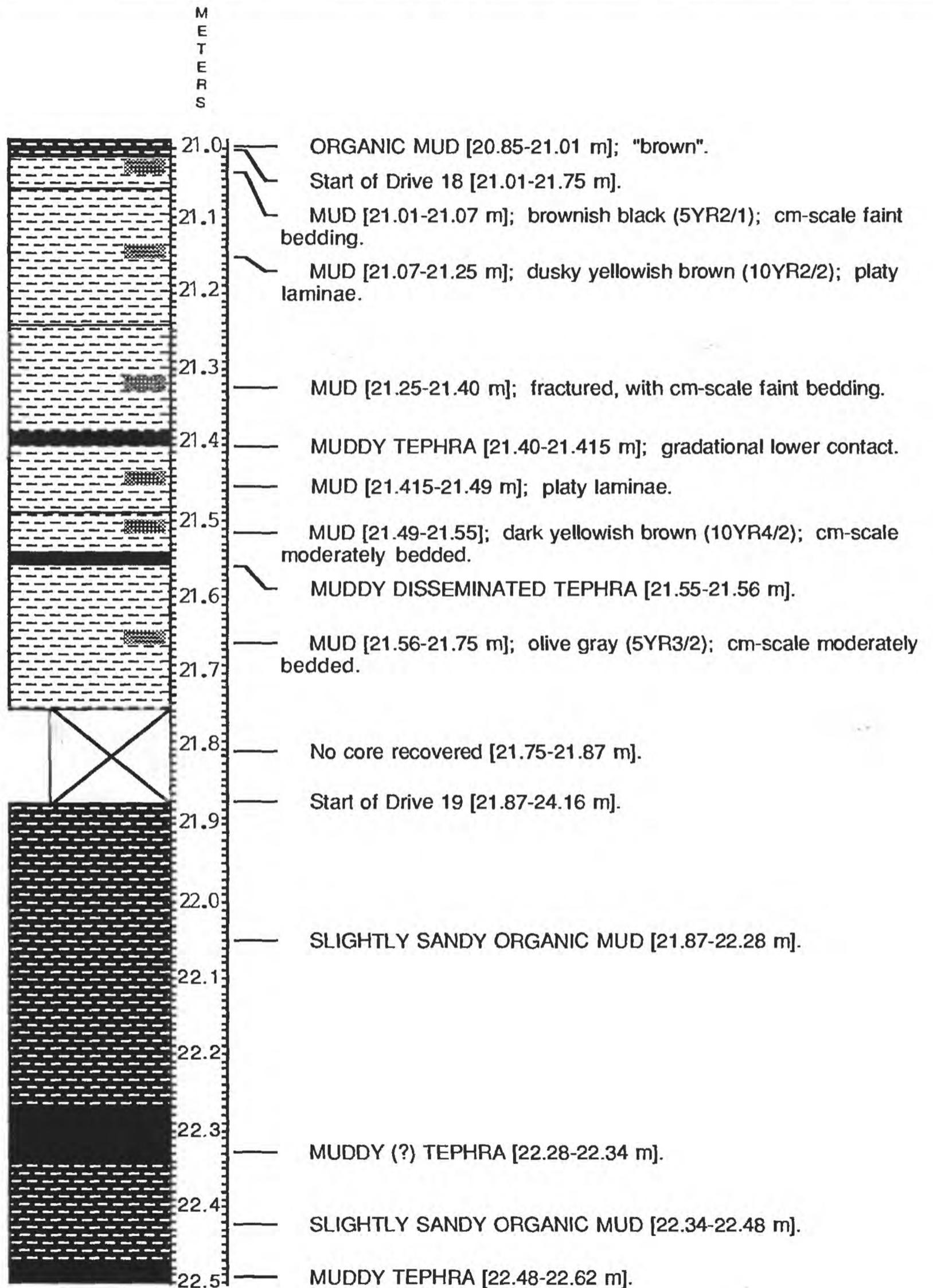
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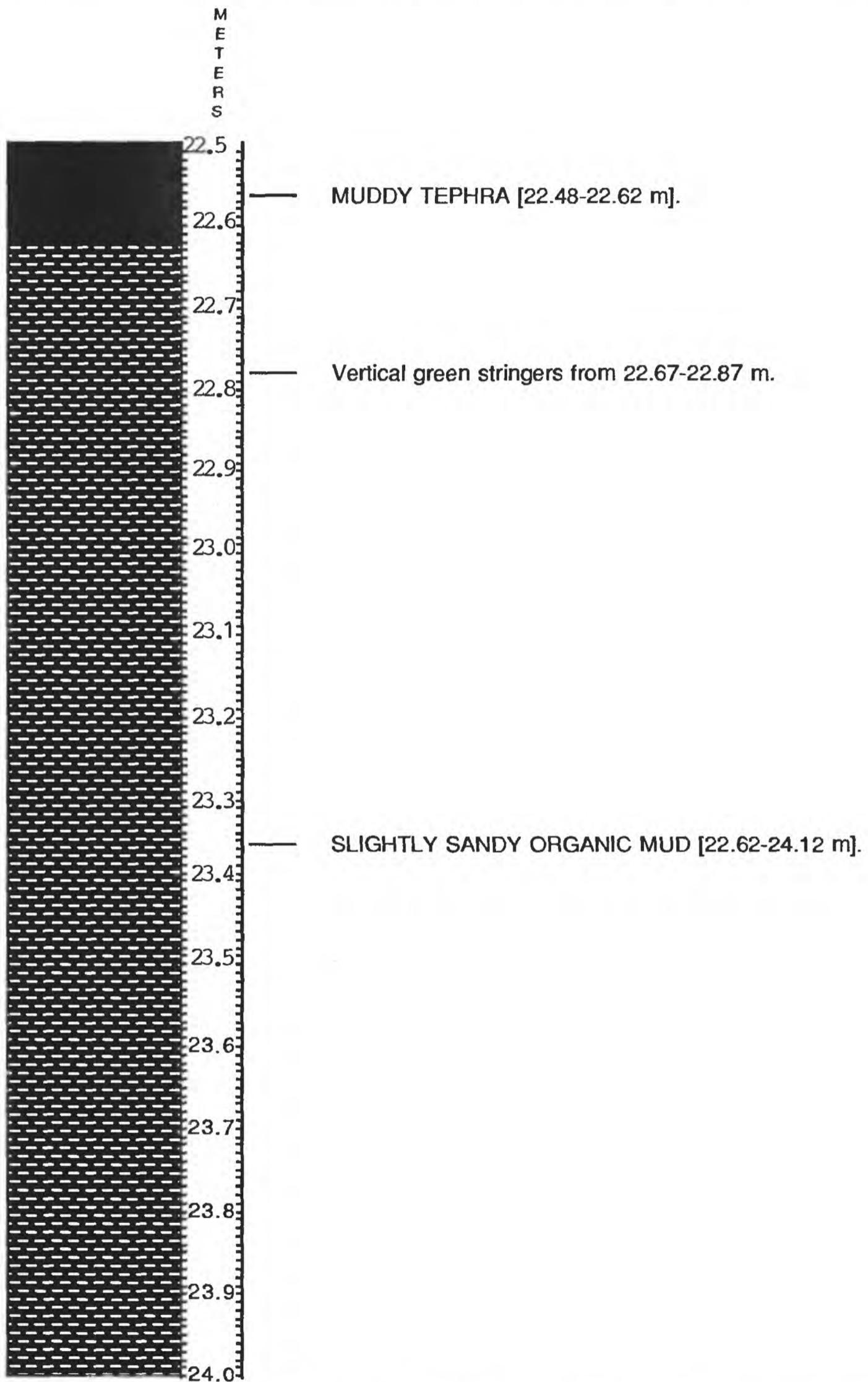
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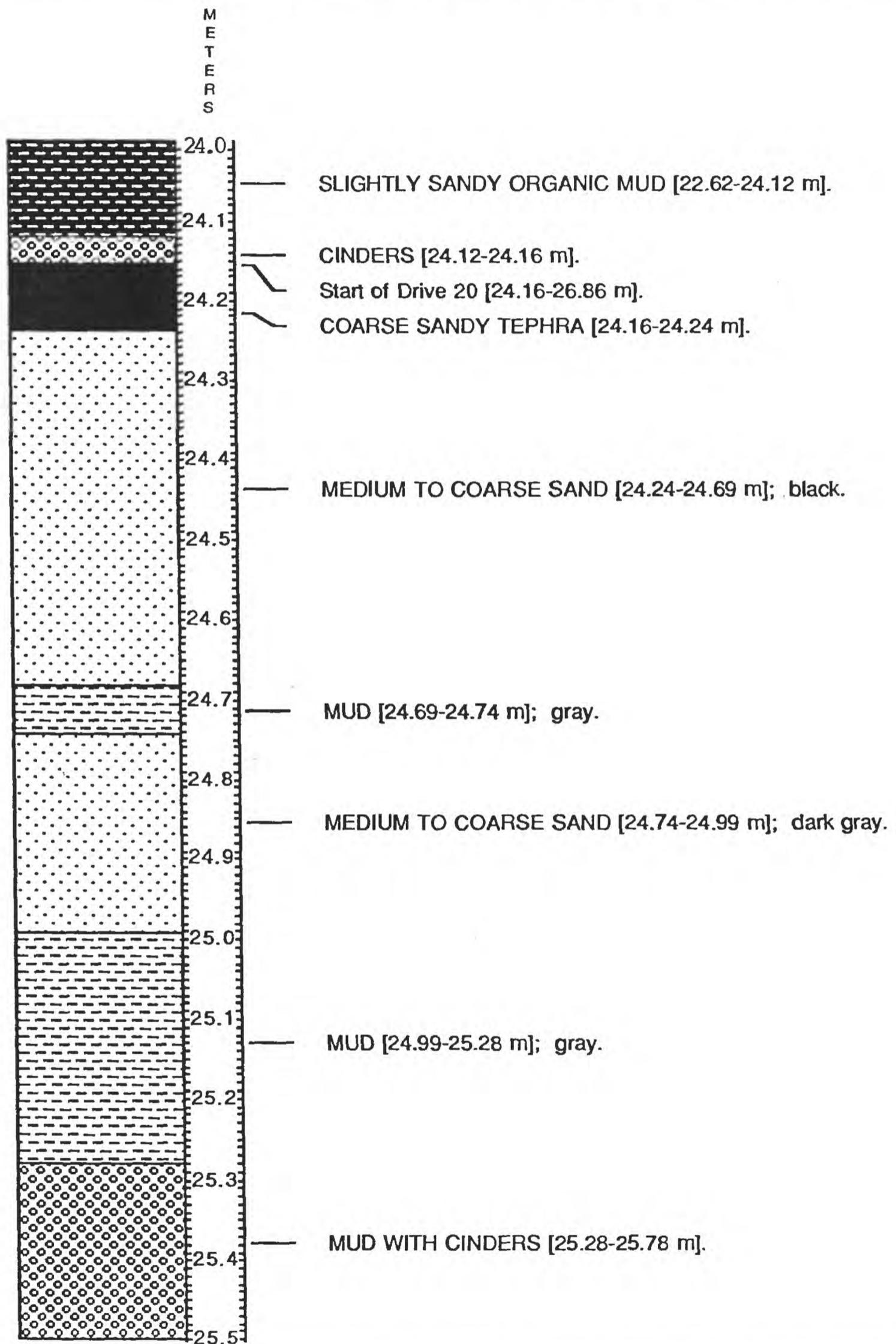
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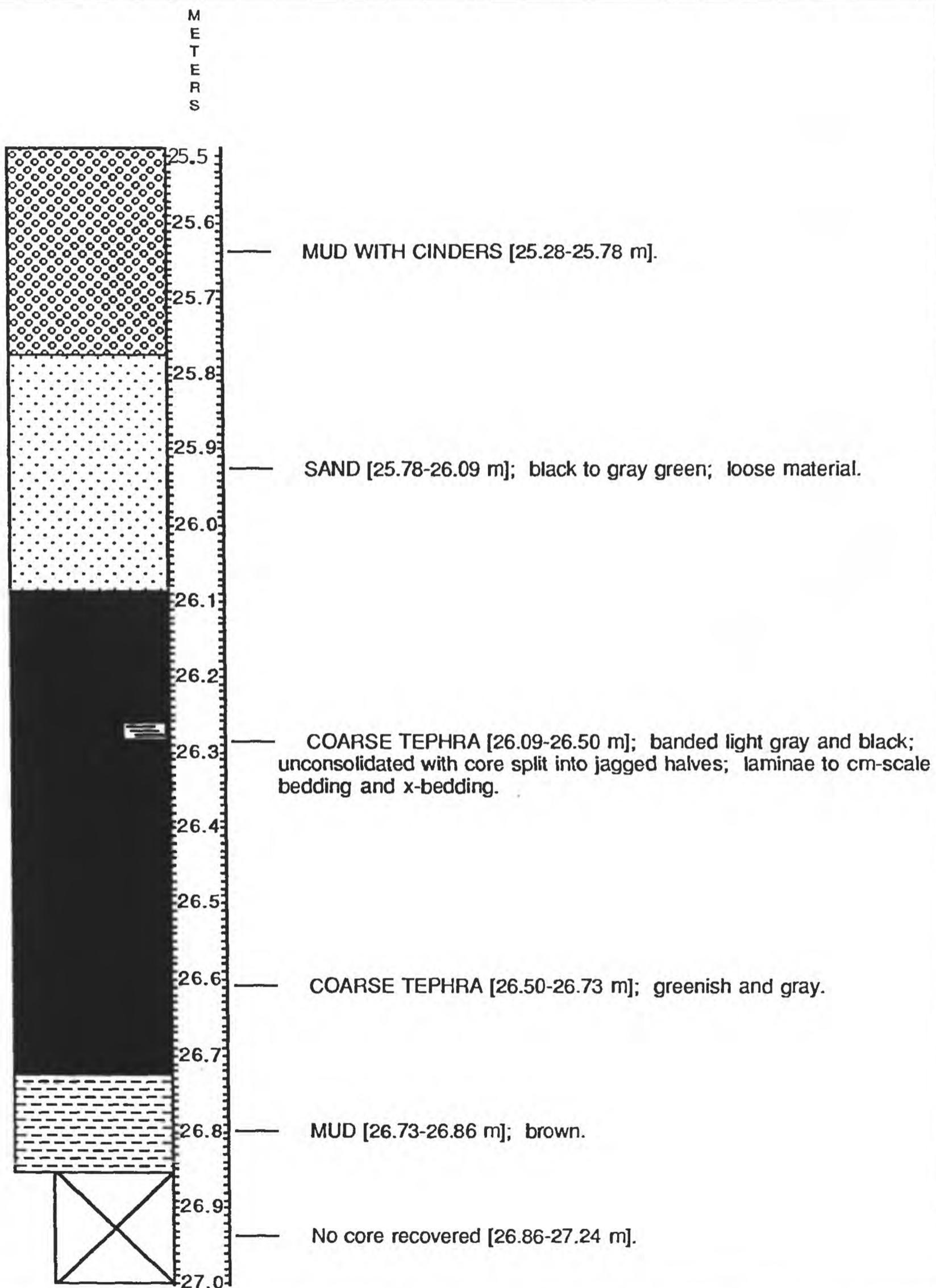
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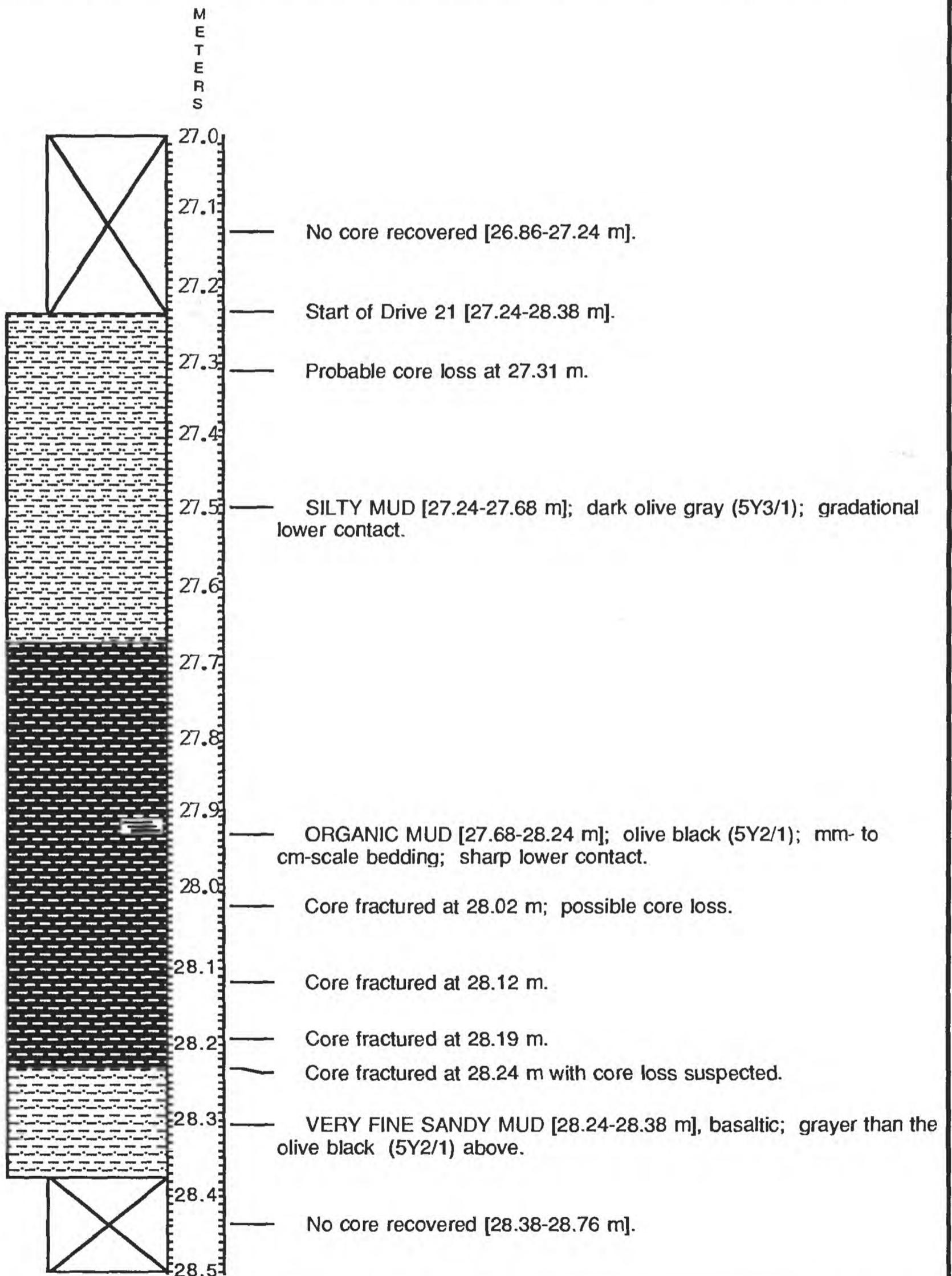
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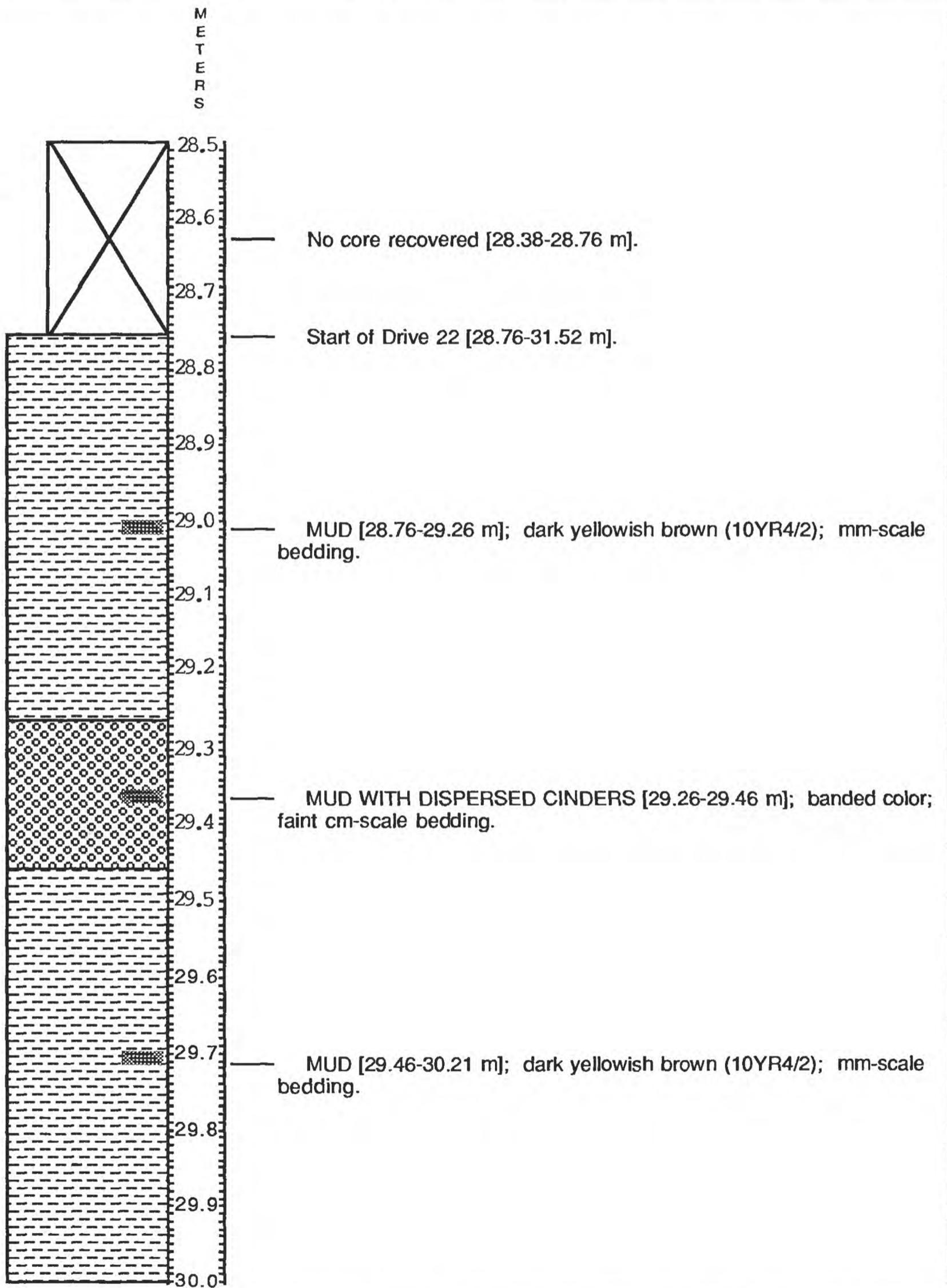
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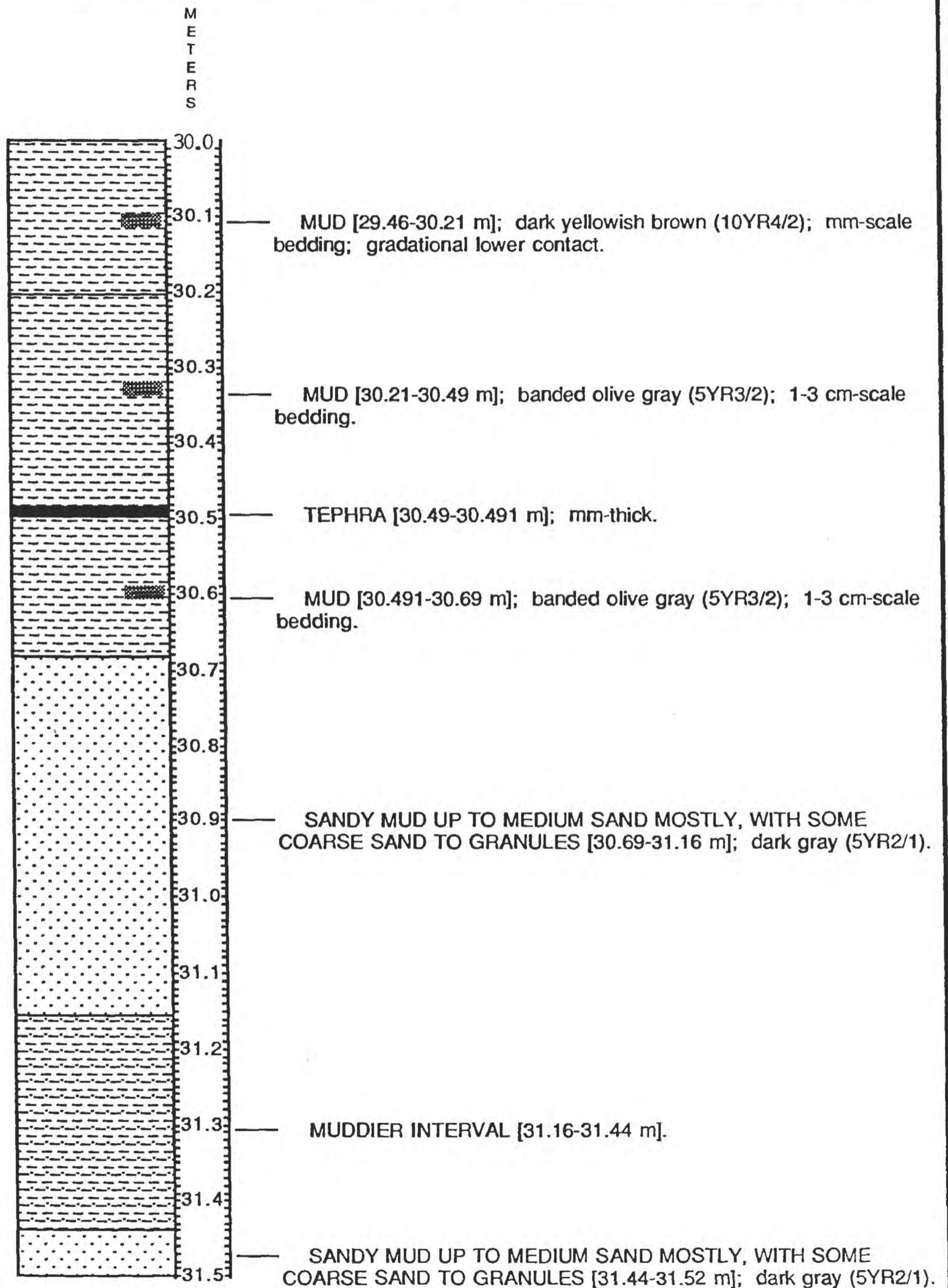
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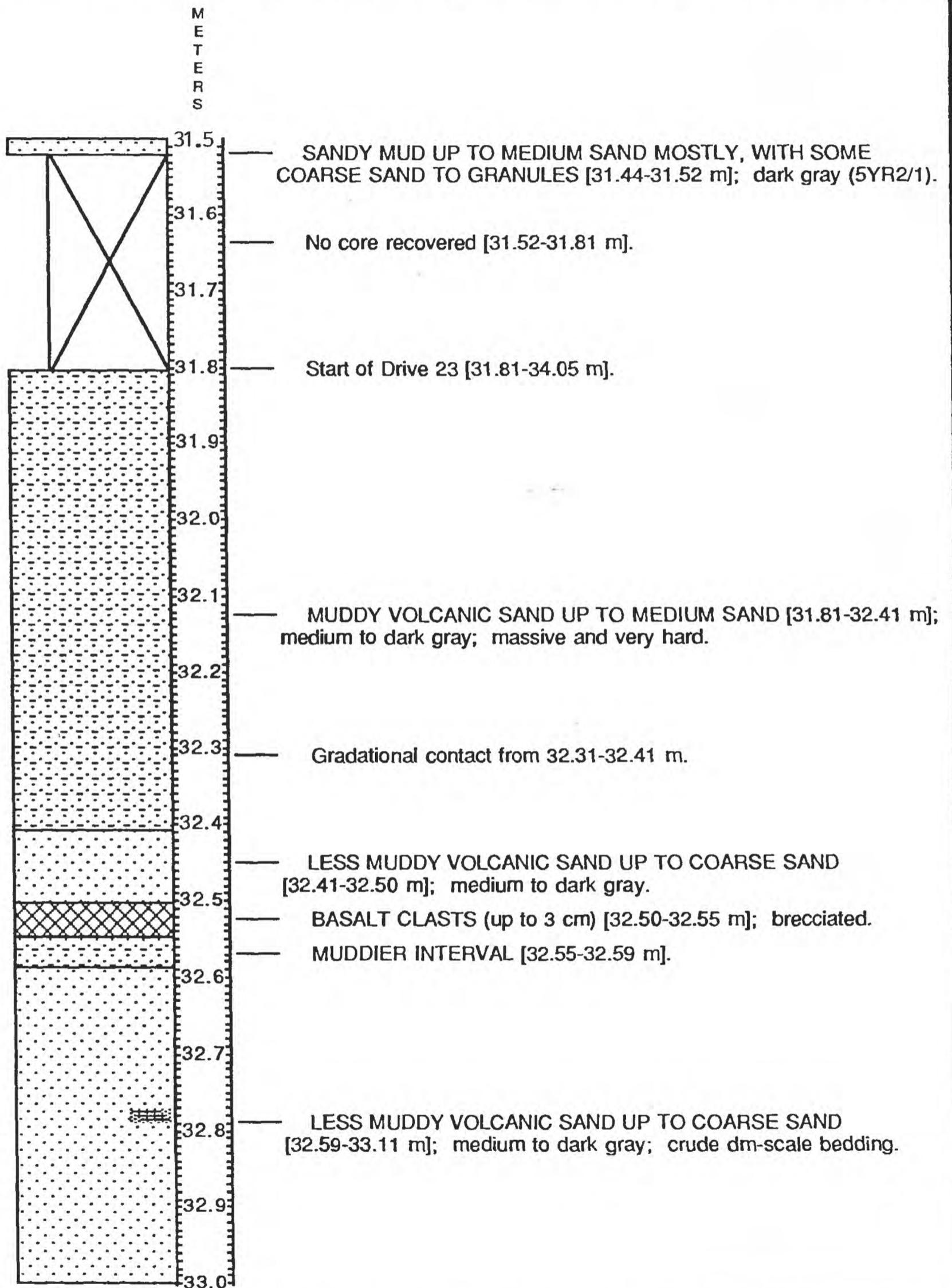
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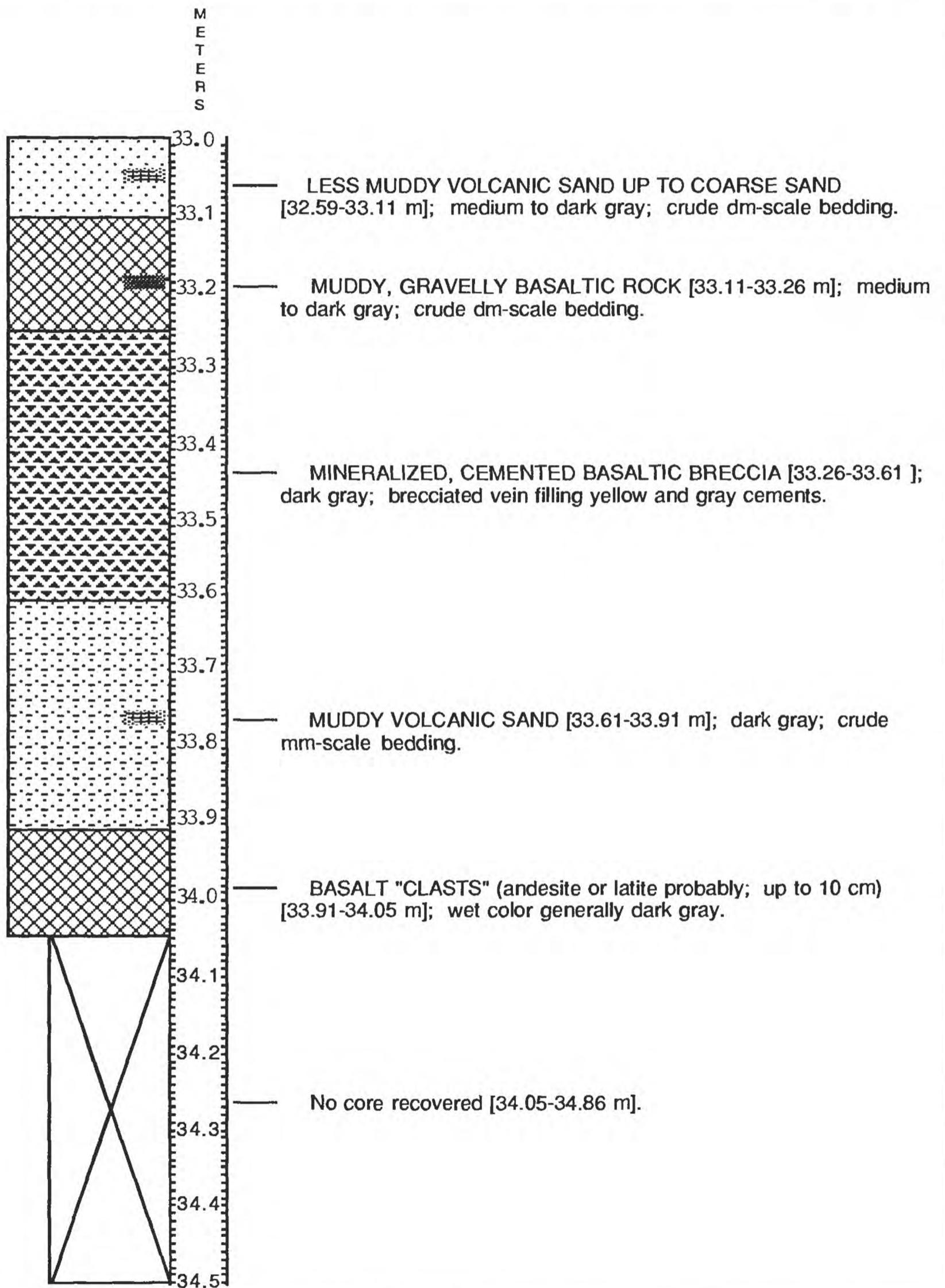
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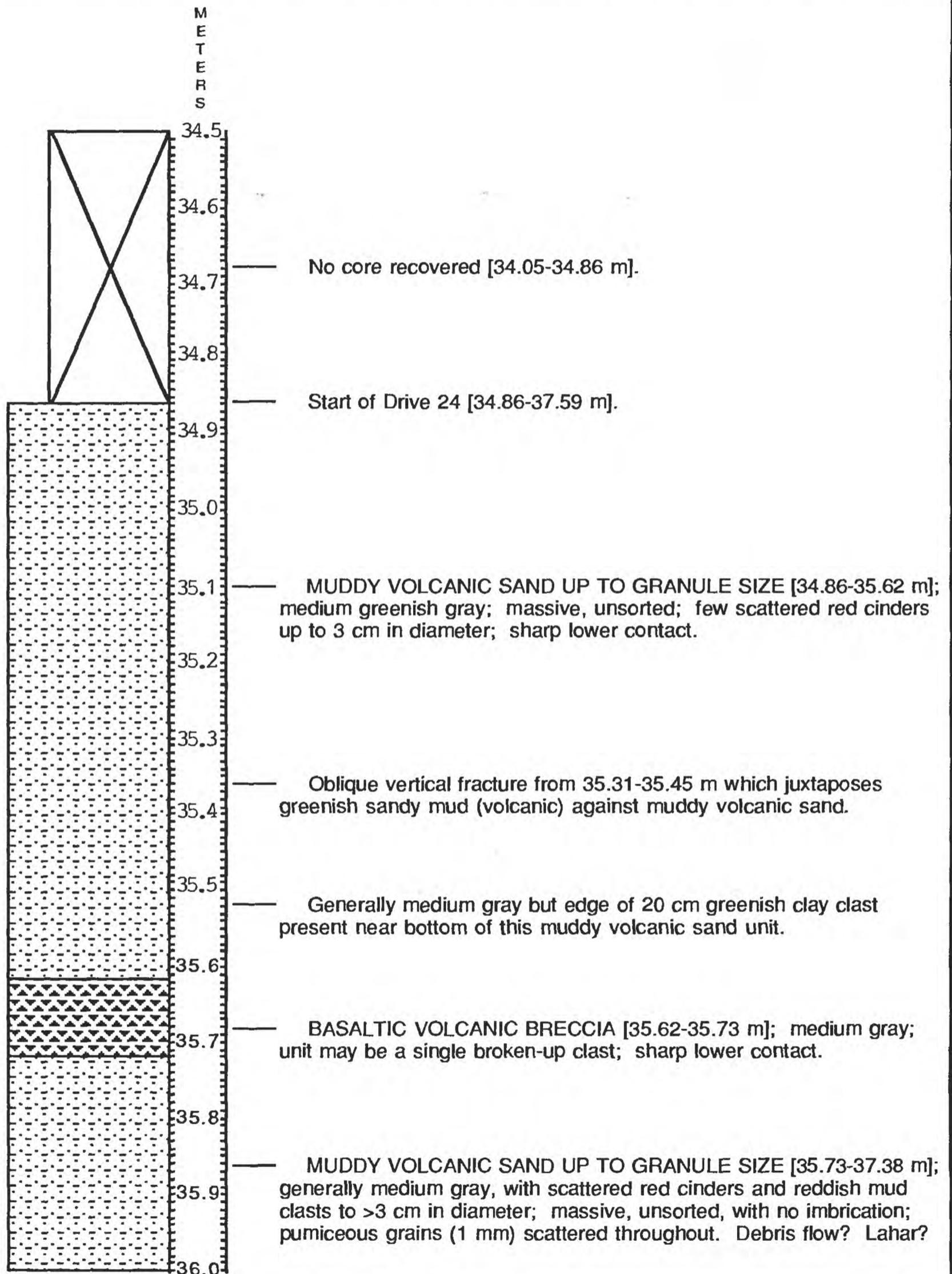
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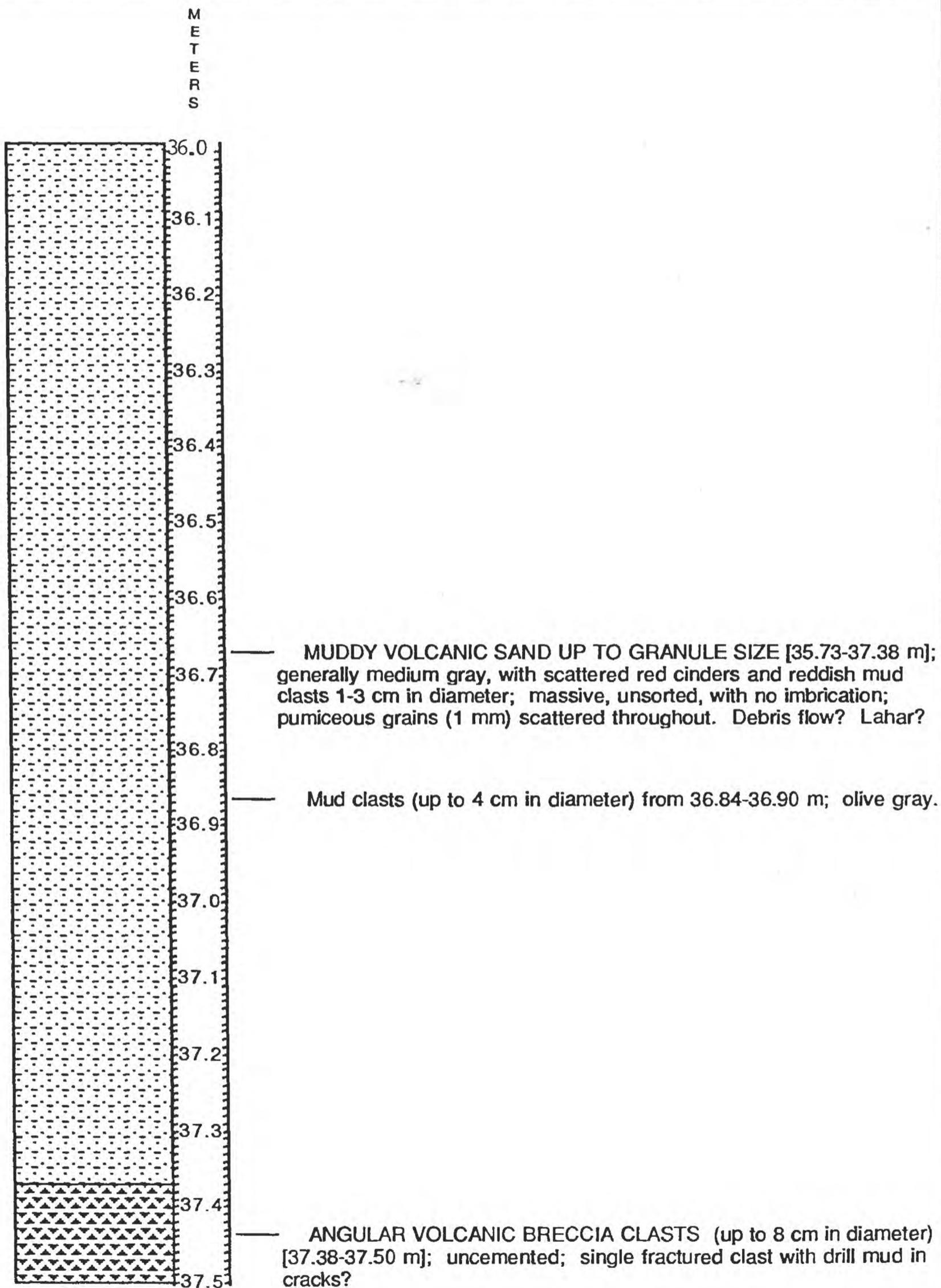
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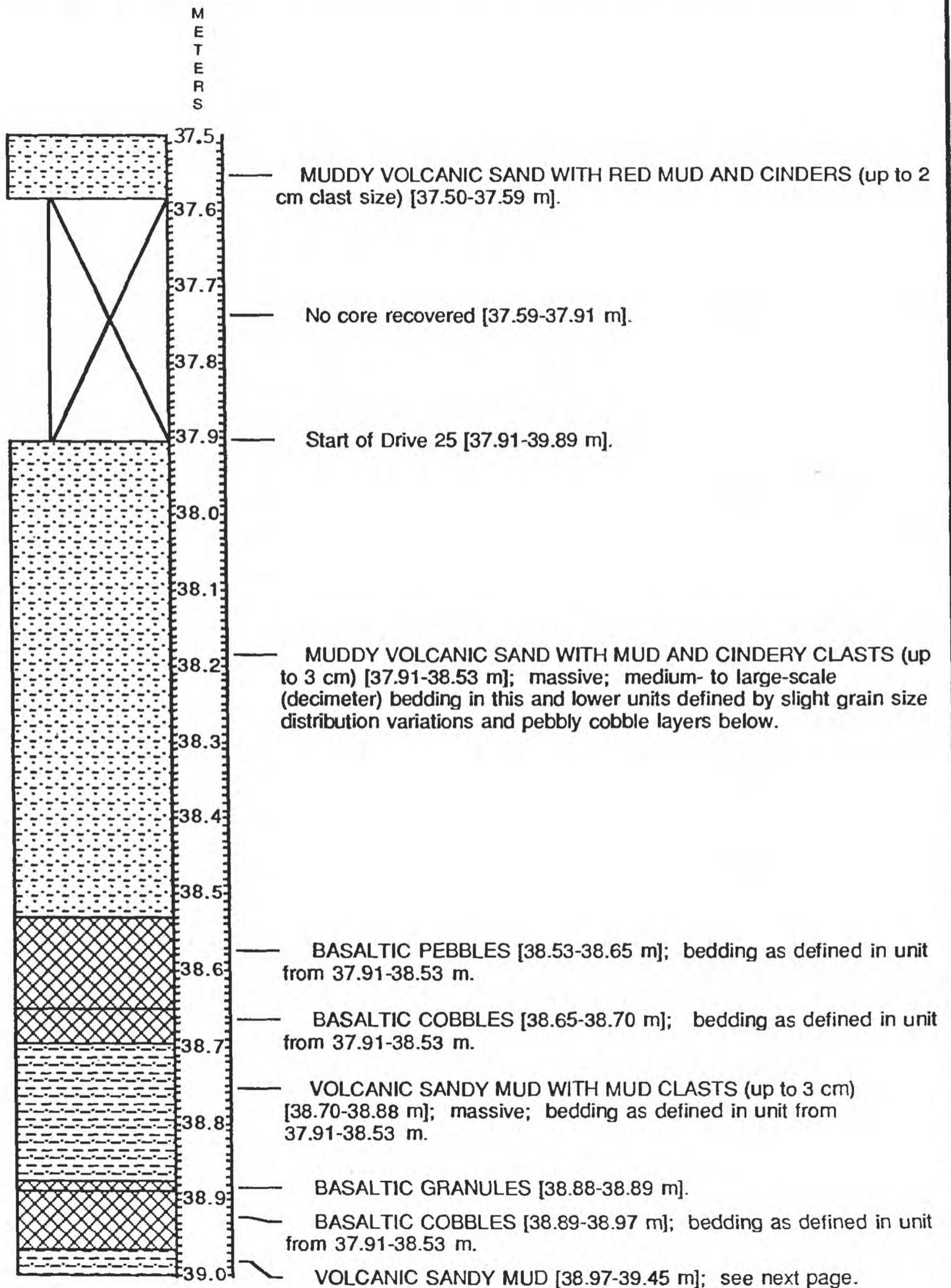
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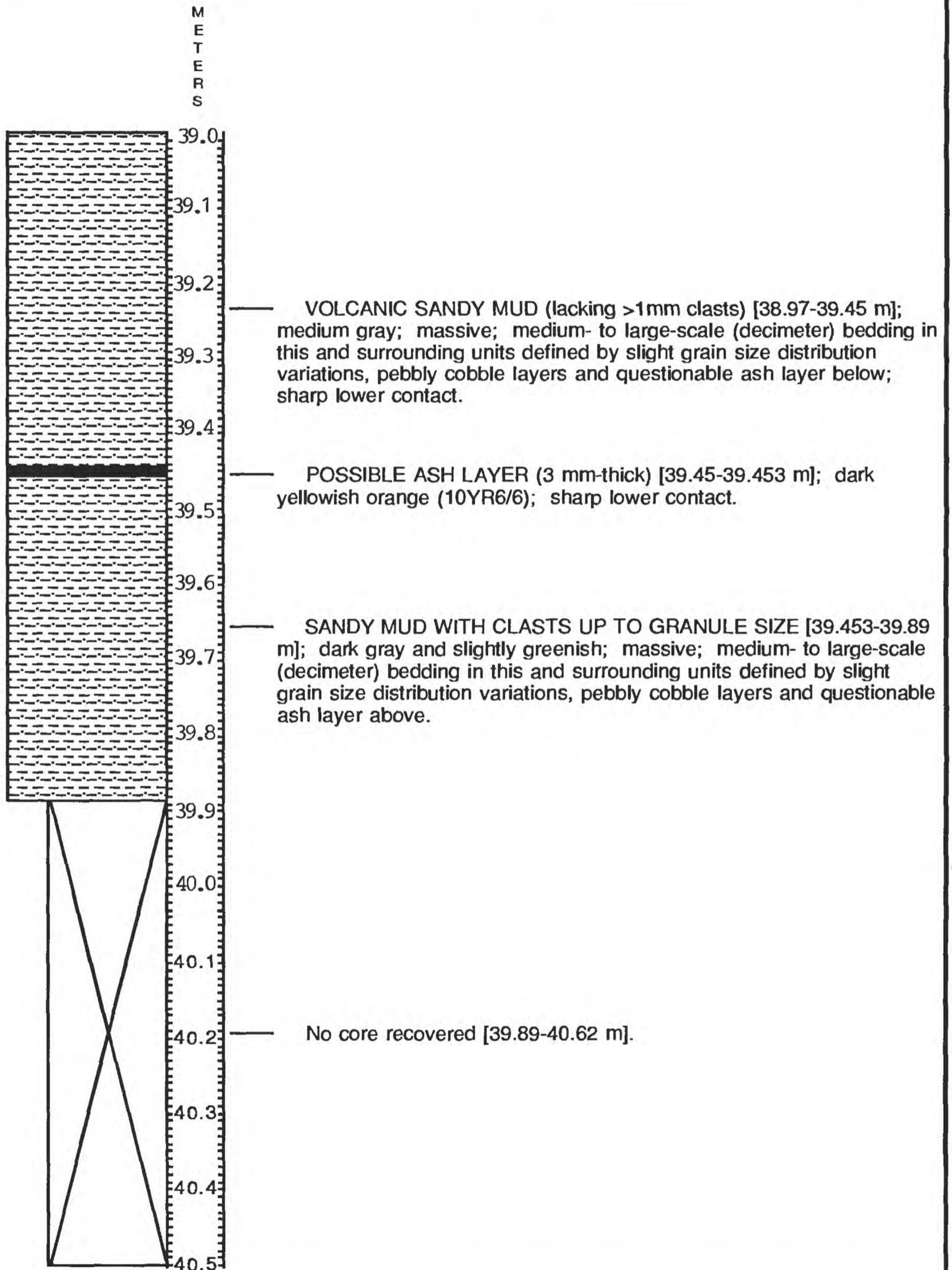
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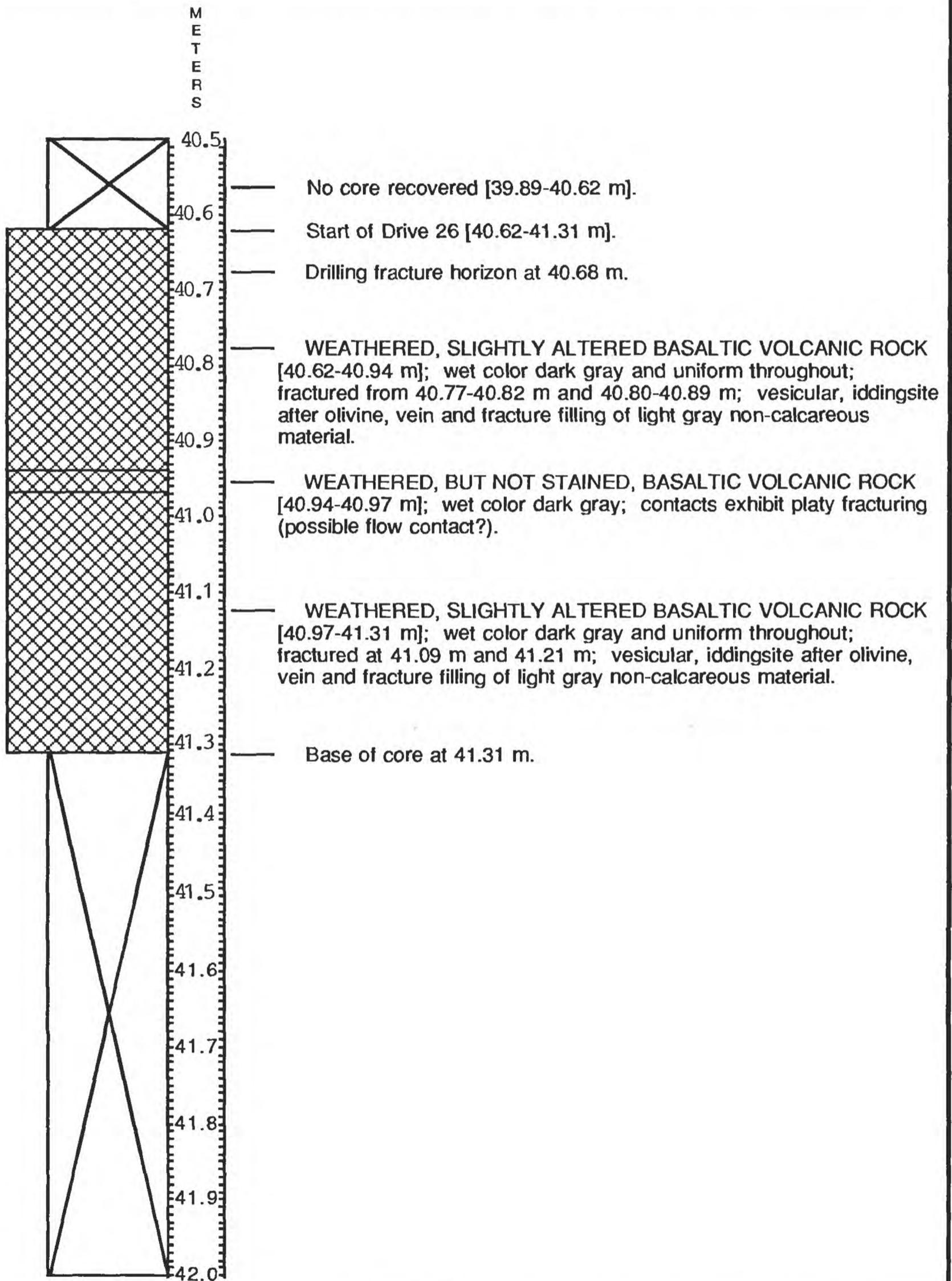
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Buck Lake, Core 1 Klamath County, Oregon

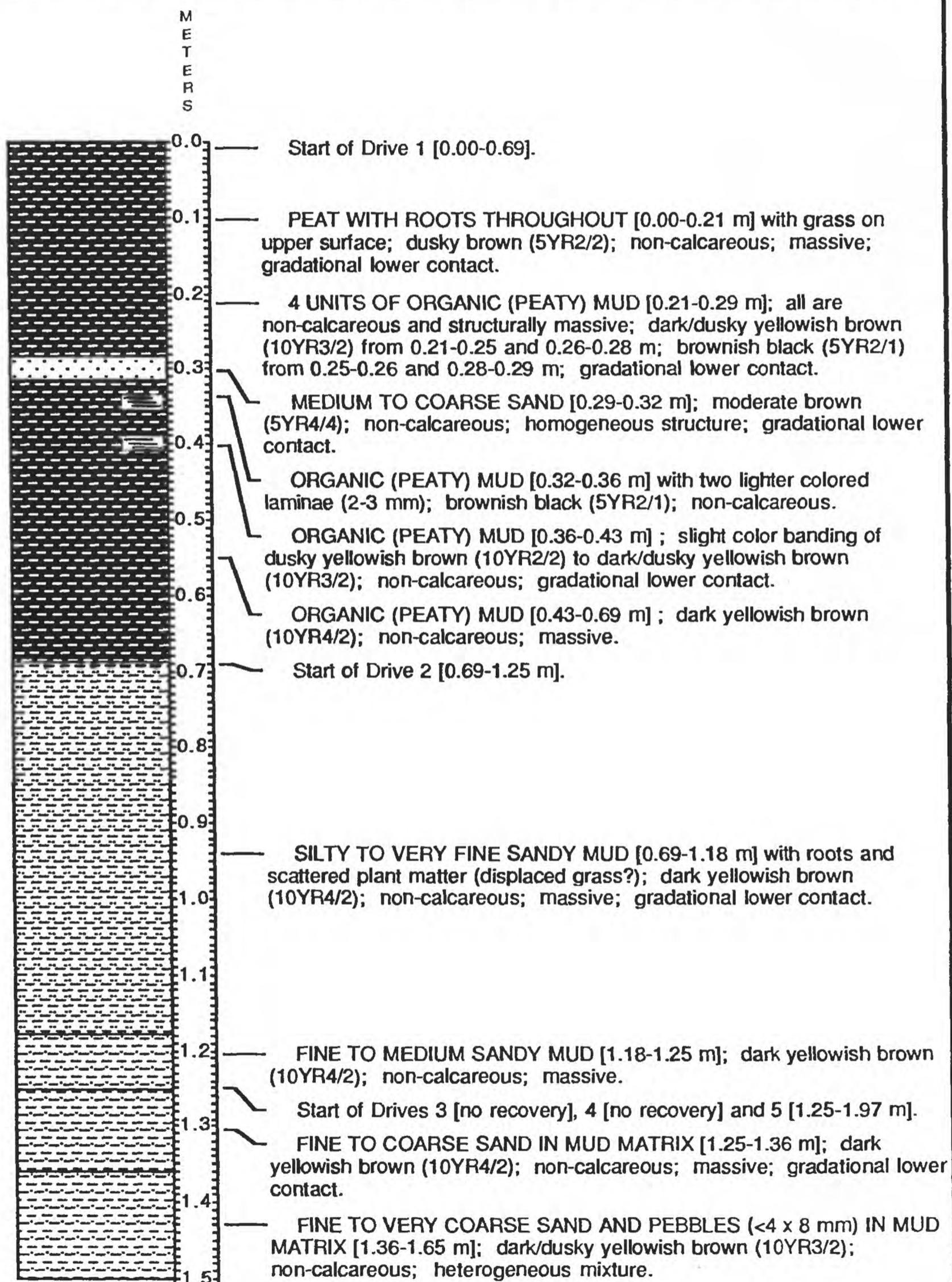


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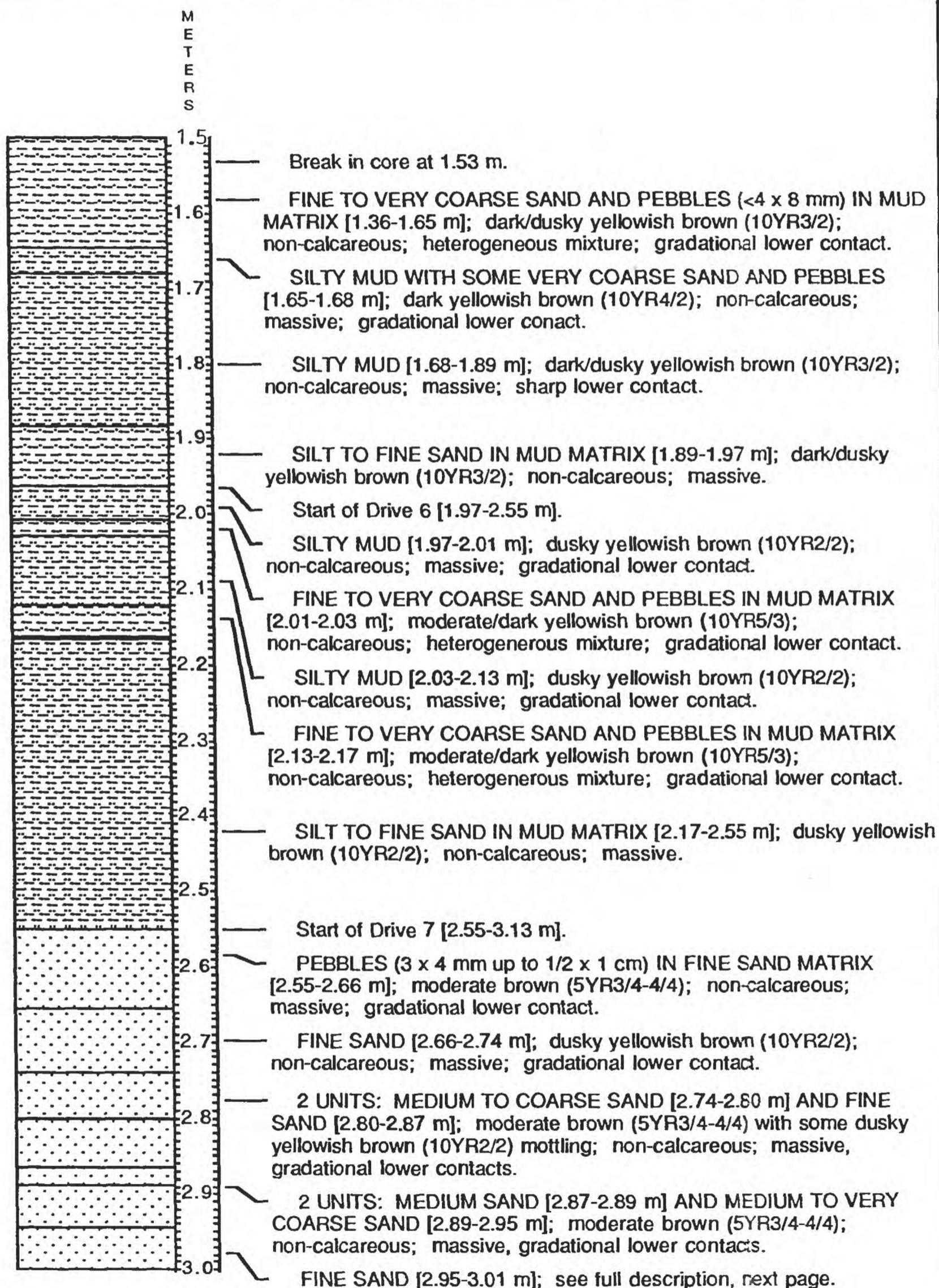


Appendix C
Core 2 Lithologic Log

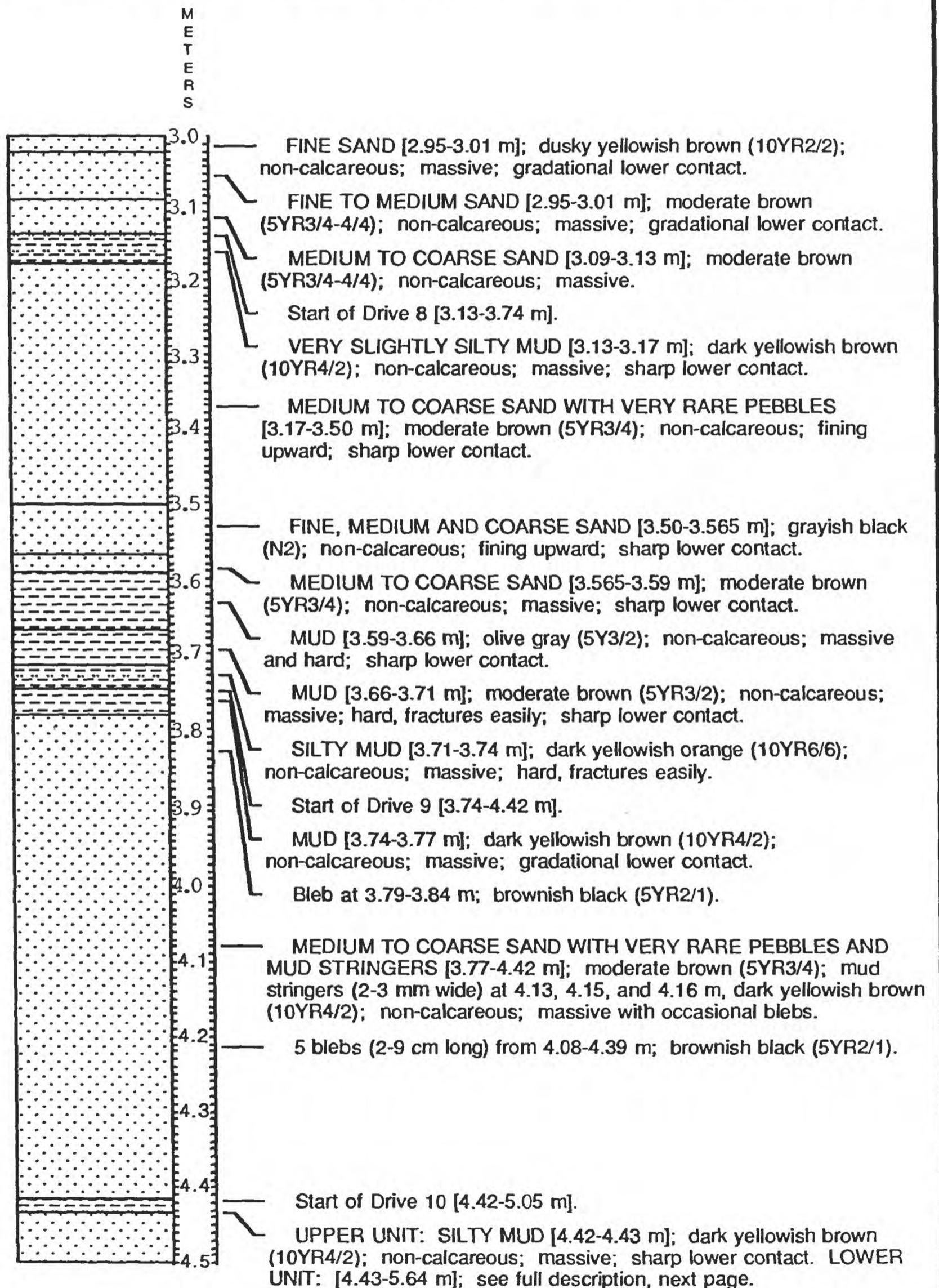
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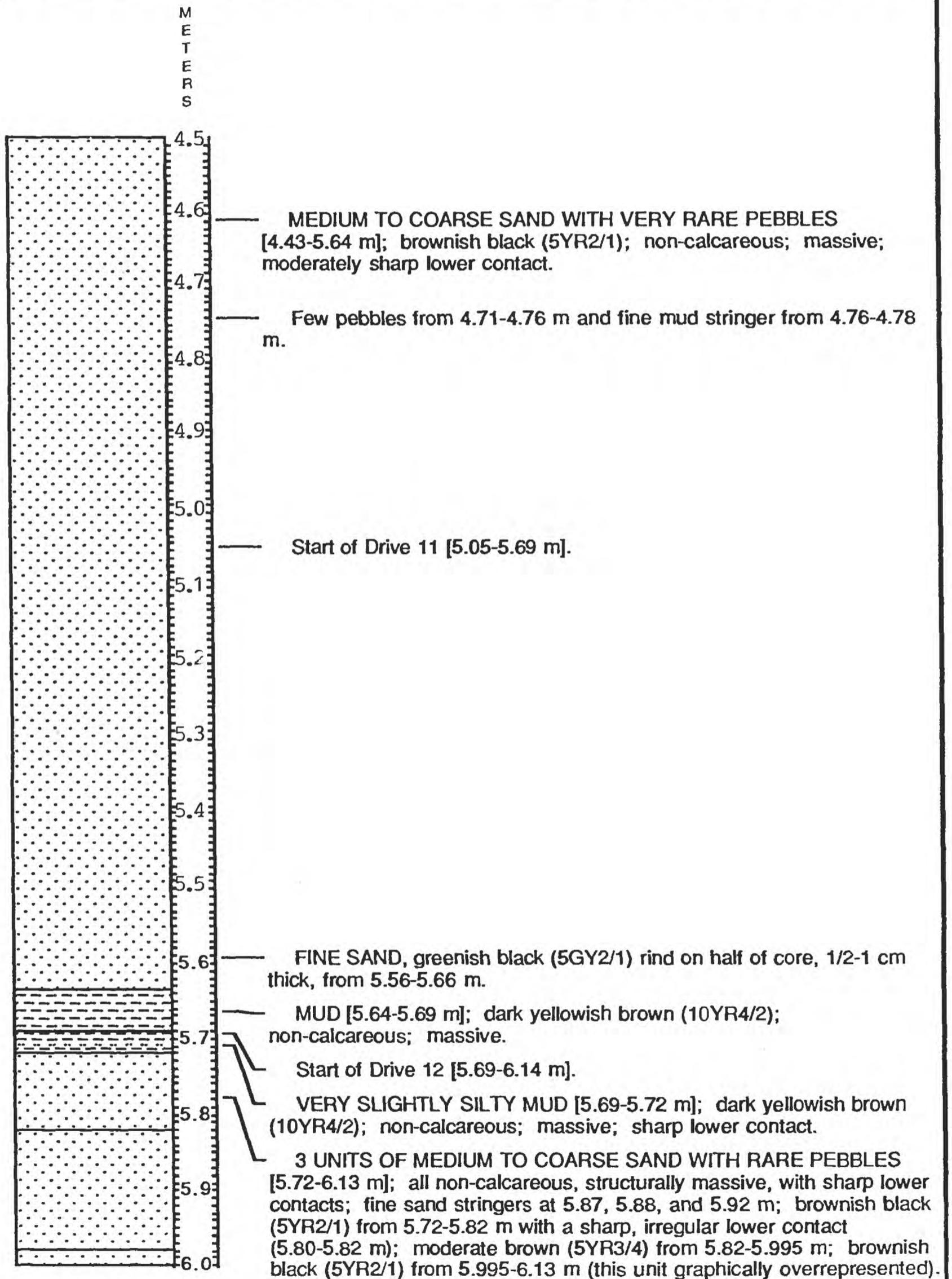
Buck Lake, Core 2 Klamath County, Oregon



Buck Lake, Core 2 Klamath County, Oregon



**Buck Lake, Core 2
Klamath County, Oregon**



Buck Lake, Core 2 Klamath County, Oregon

